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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Chemical Engineering Group

THE keynote of the Newcastle Conference on "The Transport and Distribution of Liquids" was efficiency, both in arrangement and from the technical point of view. Although appliances such as those discussed and exhibited are primary necessities in chemical factories, the broad principles underlying their correct scientific and economical application have probably only been studied in the larger factories. The simultaneous presentment of so many different appliances, together with unvarnished explanations and discussion by manufacturers and users, was an unique opportunity for those desirous of bringing their knowledge up to date. It avoided the necessity of wearisome correspondence and interviews with commercial representatives, who are obviously unable to carry about with them full-sized pumps and apparatus, such as those exhibited. One or other of the centrifugal pumps on the market can now be relied upon to handle efficiently any acid or liquid, hot or cold, while the automatic acid elevator may fairly be said to have definitely consolidated its reputation for reliability and convenience. As regards design, British manufacturers have effected considerable improvements compared with the best pre-war German appliances, and have developed them to suit the most varied conditions. That one with a special impeller should have been dubbed the "Trade Union Pump," because it restricts the output, is a sign of the times, but fortunately the general trend of thought is in the other direction and aims at increased efficiency. The discussion brought into prominence the almost complete absence of standardisation of pipelines, fittings and pump connections; even the distance between the flanges of cocks and valves of the same diameter varies with every individual maker, and in case of replacements the effect is deplorable.

The utility of the Chemical Engineering Group seems definitely established and the conduct of the meetings was eminently businesslike. The advance copies of Papers, which we think should be available at least a week before the meeting, make it unnecessary to read Papers in full, and the slips provided and the rules of procedure assisted in producing a full and brisk discussion. The Group is to be congratulated on the technical and social success of its second Conference, which, we understand, has already brought fresh members to its roll and to that of the parent Society.

The Anglo-Persian Oil Bill

THE Anglo-Persian Oil Co. (Acquisition of Capital) Amendment Bill, which was read a third time in the House of Commons on Tuesday, raises a very large issue in Imperial policy—namely, the extent to which the Government are justified in investing national funds in private business undertakings. The vital clause in the Bill is the first, which authorises the issue out of the Consolidated Fund of such further sums, not exceeding £2,500,000, as are required for the acquisition of share or loan capital of the Anglo-Persian Oil Co. As a general principle it may safely be taken that the sense of the trading community of this country is against the State becoming entangled in private concerns, particularly where, as in this case, international obligations of a serious character may be involved. The arguments against the policy were forcibly stated, though they did not prevail. In the first place the investment of State funds in private concerns is always viewed with a certain suspicion. Where companies are known to be backed by the resources of the State, or where it is known that the State con-

templates such action, there is the danger of gambling on the strength of the official connection. It is better, unless there are imperative reasons to the contrary, that the Government should stand severely aloof from private adventures and speculations. The second reason is still more substantial. The property of the company is in Persia, a point where, before the war, the imperial ambitions of several great powers met, and to some extent conflicted with one another. Moreover, Persia is notoriously far from stable. There might, as Lieut-Commander Kenworthy pointed out in the debate, be a call for the protection of Government property in Persia, and while we might not be prepared to send an expedition to protect the property of private individuals or corporations, a much stronger case might be made out for sending an expedition to protect Government property. The nation might thus be involved in liabilities, military and political, far beyond the commercial interests involved. It is generally recognised now that the German policy of linking up State interests with private commercial speculations was a powerful influence in bringing about the war. Its interest in the Bagdad Railway had a very marked bearing on our own interests in the Far as well as in the Near East, and with such lessons before us, the desirability of avoiding all possible causes of international differences must be obvious to all.

As against these general grounds of objections, what are the special reasons that justify the Government in investing another sum of two millions and a half in the Anglo-Persian Co.? The first put forward was that the money previously voted has proved a good investment. The assumption behind this is that there is nothing wrong in Government speculation so long as the speculation turns out well. The good sense of the country, we are sure, is dead against such a proposition. The next is that oil supplies have become essential for the navy and mercantile marine, and that Persia is the place to look for such supplies. If Persia is, indeed, the oilfield of the future, then national interests might, perhaps, justify exceptional steps for securing a controlling share in it, but on this essential point the debate was not quite convincing. The third reason is that with an Empire of our size we must take the necessary steps to safeguard its future, and that in this case we are supremely interested in Persia on account of its geographical relation to India. We are afraid it is impossible wholly to ignore this political argument, and, taken in conjunction with the others, it convinced the House of the necessity of extending its financial interest in the Persian oilfield. But, apart from the exceptional circumstances, there was nothing to modify the general distrust of State intervention in commercial adventure.

During the debate some interesting references were made to the shale-mining industry in Mid and West Lothian, in which it is understood the Anglo-Persian Co. is interested. Judging from the recent opinions of Scottish experts, there are grave doubts as to the prospects of building up any great Scottish oil industry. There is, however, no doubt at all, as to the discontent among the Scottish shale miners, and when it becomes known that the Government are in part their employers, on the Government will rest the duty and responsibility of seeing that the grievances are redressed.

Chemists' Salaries

We have received from a senior works chemist, with a long experience and an excellent record of inventive work, an almost pathetic appeal on the subject of chemists' salaries. "Cannot you give us," he writes, "a strong article in The Chemical Age on the shamefully low salaries of chemists and the apathy of manufacturers in not recognising their value? In your issue of December 6 (p. 66), your reviewer O. L. B. takes exception to the statement as to young chemists' wages, which he says are now over rather than under £300 per annum. There are scores who wish that O. L. B. could prove it. Let me give my experience." Our correspondent gives his experience, and it makes a sad story. He is, and has been for over a quarter of a century, head chemist at a very large and important works. He has been successful at research and invention, and his processes, he states, have been sold for as much as £50,000. His salary is £300!

It is not, however, of his own case that our correspondent seems to be mainly thinking, but of the position and prospects of the young and ambitious chemist in this country. "I have had youths," he writes, "training under me who were paid £1 to 35s. per week, and could get no more. When they found that they must move if they were ever to get a living wage, they did so. The last who left me got 30s. a week; he went straight to £225 a year and in a few months proceeded to £300 and bonus. This one was paid less than youths and girls doing menial work in the place, although he had had four successful years at a well-known technical school, and had also a practical knowledge of works conditions. No wonder our young men go abroad. My own son went to Germany where the manufacturers, whatever their faults in other directions, appreciate the value of the chemist's services. I do not see the sense of using money in training young men in the schools, &c., to be of no use to their own country; nor of young men training for a scientific calling which will not bring them a living. A young man may be apprenticed, say, as a mechanic, and at the age of 21 he has a trade in his hands and can enjoy his leisure. While the mechanic can spend his leisure with billiard balls and bottles of Bass, the young man studying chemistry must be with his books, bottles and balance, and at the age of 28, not 21, he too often finds himself with no hopes and no living, when it is too late to begin to learn a trade. I hope you will give us an article on this subject which will be much appreciated by the many young chemists who read The Chemical Age." It would be difficult to offer any comment which could add to the effect of our correspondent's letter. The bare facts are the most effective statement of the case.

The Pyrogallic Acid Case

The decision announced in the High Court on Tuesday, in an action arising out of the seizure by the Customs authorities of a consignment of pyrogallic acid from America, is one of those rare judgments in which the law coincides with common sense. The importers were Messrs. Brown & Forth, a firm of British chemical manufacturers. They challenged the legality of the

Customs' action, and had judgment given in their favour by Mr. Justice Sankey, a result which compensates them for the trouble, though probably only partly for the heavy costs of the action, and will bring them the congratulations of all engaged in the chemical industry. The case turned on the interpretation of Section 43 of the Customs Consolidation Act of 1876, which provides that " the importation of arms, ammunition, gunpowder or any other goods may be prohibited by Proclamation or Order in Council." Upon this clause was founded the Prohibition of Imports Proclamation, 1919, which, as the Customs authorities contended, gave them the necessary power to make the seizure in question.

There were two aspects of the issue before the Court—the one general, the other of more particular interest to chemical firms. The first was whether the words " any other goods " literally meant everything, for in that case, as Mr. Justice Sankey pointed out, it would give the Executive power at any moment to abrogate the entire Free Trade policy of the nation, and to exclude imports of any and every kind. The Court found that the section did not confer this unlimited power, taking the common-sense view that the words " or any other goods "—coming immediately after the words " arms, ammunition, gunpowder "—must mean goods of that particular class—that is to say, munitions of war. The second and the narrower issue was whether pyrogallic acid belonged to this class of goods. The Crown argued that it did on the ground that, pyrogallic acid being used in photography and photography being used in war, the acid was among the munitions of war. It must have tested Sir Gordon Hewart's genial sense of humour to put such an argument with the proper solemnity of countenance. On this reasoning, one would have to treat almost every article of daily use as war material, and the court very properly dismissed it as nonsense. Two good results may, perhaps, follow this decision. It may teach our Customs authorities that there really are limits to their powers, and our legalists that restrictions which may be vital to national safety in time of war are not intended to be continued as punitive and suppressive measures in time of peace.

The Education of Labour

At the Institute of Chemistry dinner in Liverpool the other evening—the first organised by the Liverpool section—a point well worth consideration was made by Alderman Muirhead. Touching upon the eternal labour question, introduced by Mr. John Gray, he suggested the endowment of a chair at the university for the purpose of teaching trade union leaders something of the principles of political economy. Like most people who know anything of the organisation of industry, he regards production as the only way to prosperity, and the limitation of production as a fatal obstacle to progress. A system of grading, he argued, is necessary, and trade union leaders should recognise that some men are able to do a larger amount and a higher quality of work than others. The standardisation of the volume of work and the amount of remuneration was, no doubt, originally meant to safeguard the weakest from being forced to the wall, and to that extent is quite a humane idea; but the evil of the practice lies in the rigid limitation which it puts on human energy above this standard, in the sterilisation of a large margin of brain and hand power in the superior types of workmen which ought to be available for the service of the community, and in the depression of the standard of output to the capacity of the least competent. At a private gathering a few evenings ago we heard one of the most trusted members of the Cabinet express the view that at the next general election a great increase in the power of the Labour Party was almost certain, and that even the return of a Labour majority was possible, though not quite likely. In such circumstances the pity is that so few of the labour leaders are able to look at things from any other than their own class point of view. If they broadened their outlook, and sought to develop the qualities of national statesmanship, there might be worse things for the country than a sensible Labour Ministry; but government in the interests of any one class promises little hope of any real progress. It is largely a matter of education, and if Labour is destined in the near future to be the dominant party in the State, the sooner the better it begins seriously to educate itself for its responsibilities.

Fixed Prices for American Potash

An interesting discussion is now proceeding in some of our American contemporaries on the question whether there should be a fixed price for American potash. The United States Potash Producers' Association appears to be against the adoption of a schedule of maximum prices. According to Mr. F. W. Brown, the executive secretary of the Association, all that American potash producers need is a brief period of protection to make the readjustments incidental to changed conditions. This period they place at five years at the outside, and two years as an irreducible minimum. The producers claim that with this limited period of protection they can put their plants in a position to compete in the open market with " any potash resources on earth." Mr. Brown challenges the assertion that " the American industry can stand on its own feet, and can now compete with foreign importations, barring dumping, trade war, rebates and such unfair practices." " The present quotations," he states, " for foreign potash range from 1.50 to 1.70 dollars a unit. Our producers cannot now meet these prices, but will be able to meet them, and possibly lower them, in a few years' time, if protected from unrestricted European importations during the brief readjustment period. The American producers agree that with correct technology they will be able to compete, but they claim a brief time to install equipment which shall be technically correct, and time to reduce somewhat the excessive capital investment which now stands against the plants. The preference of the potash producers for a licensing measure instead of a protective tariff is based primarily on the fact that with a license system the consumer will get his potash cheaper than under an adequate tariff."

Reviews

THE CHEMICAL ENGINEERING CATALOG, 1919 (4TH ANNUAL EDITION). The Chemical Catalog Co. Inc., 1, Madison Avenue, New York. Pp. 1199. $5.00.

This volume is published annually under the supervision of a committee appointed by the American Institute of Chemical Engineers, the American Chemical Society, and the Society of Chemical Industry, the members of which are giving their time and attention free of charge to the supervision of the work. The volume is a compilation of condensed catalogue data of manufacturers supplying the chemical engineering field, standardised as to page size and typographical arrangement. It covers practically every field of chemical industry, and also includes data in regard to allied trades having an important and direct market in chemical firms. These include the manufacturers of power plant equipment, conveying machinery, power transmission, testing, measuring and recording apparatus and materials of construction.

This latest edition of an almost invaluable book of reference includes several new features, and a most comprehensive classified directory of equipment supplies and materials running to nearly 260 pages of indexed matter. The section dealing with technical and scientific books, comprising 53 pages, includes abbreviated particulars of the contents of all the best books in the English language, and should prove very useful to firms and others wishing to start or supplement their technical libraries.

Although it has been found that firms taking space in this catalogue derive commercial benefit, the volume is not regarded as advertising matter, and anything in the way of display advertising or "selling talk" is rigorously excluded, as are all general claims and exaggerated statements. Every effort has been used to develop and encourage publication of precise data, such as specifications, construction details, tables of sizes, capacities and specific uses or adaptations of equipment and materials. In addition, a special information bureau has been established for the free use and benefit of everyone seeking information covered by the catalogue. An interesting feature of the service rendered to firms taking space is the free distribution of a printed list showing the names and addresses of the firms and individuals to whom the catalogue is issued, and comprising 11,000 names of chemical engineers, works managers, buyers, consultants, chief chemists, heads of universities, Government departments, &c. The latter are on the free list, while those not included in these categories can purchase the catalogue. The number of firms included in the book has increased to 604, and the number of pages has quadrupled since the first edition was published in 1916.

The remarkable expansion and the recognition of this catalogue as a reference volume proves that the education of the individual buyer is more effective than ordinary advertising, because such buyers are looking for definite and complete data and not for generalities. It is to be hoped that something of this kind will soon be attempted in this country; the engineering trades in 1913-16 published a similar volume, entitled "The Engineers' Standard Catalogues," and now that chemical engineering has won a vital place in our industrial activities, a comprehensive scheme of this kind would do more in maintaining its position than any amount of individual effort, however well applied or conceived. Incidentally, it is obvious that concerted effort of this kind, although it must necessarily be subsidiary to intelligent advertising in the technical press, yields a handsome return on the money spent and brings essential facts to the notice of buyers more cheaply and directly than the circulation of individual catalogues.

C. J. G.

PRACTICAL LEATHER CHEMISTRY. By A. Harvey. London: Crosby Lockwood & Son. Pp. 207. 15s. net.

Previously published text-books on the analytical chemistry of leather manufacture have dealt with the subject in a satisfactory manner, but as rapid strides in this branch of analytical chemistry have been made since the publication in 1912 of Procter's "Leather Chemists' Pocket Book" (an abridged form of his well-known "Leather Industries Laboratory Book"), the recent publication by Mr. Harvey will serve as a welcome aid to the leather trade in general and more particularly to the chemists engaged in that industry. The book is divided into 20 chapters, and deals with most materials used in the tannery or currying shops. The various subjects have been brought completely up to date and include all the recent work published in the various journals devoted in whole or in part to the chemistry of leather manufacture. The incorporation in the book of various blank pages at the end of each chapter for the purpose of notes will, no doubt, be of great use to the reader for abstracts of future papers. The book is well illustrated, diagrams of the more complicated apparatus required for various determinations being given. Methods of calculating results are fully described and illustrated by numerical examples.

Valuable work published during the last few years and mentioned in the book, includes Bennett's researches on the analysis of lime liquors and limed pelt, Fortini's method for the estimation of rosin acids in soaps, and a useful note on the determination of the basicity of chrome liquors prepared by reduction of bichromate by gaseous SO_2—a method that has come largely into practical use. The paper by Thompson and Suzuki on the analysis of lactic acid (used extensively in the leather trade as a deliming agent) is described, but the author appears not to have understood thoroughly the results arrived at by these experimenters, viz., that the determination of lactic anhydride in lactic acid as described is futile because the amount varies considerably with the dilution of the sample and also that the deliming capacity of lactide or lactic anhydride is the same as that of lactic acid itself.

No mention is made of the official method of the American Leather Chemists' Association for tannin analysis, and there is no index of authors.

Useful tables are given in the appendix, and included in the text is an exceedingly valuable table drawn up by Munson and Walker for use in the estimation of glucose in leather.

To sum up, the book contains all the latest information on the various analytical procedures and should be a useful addition to the library of the leather chemist.

W. R. A.

MODERN ROADS. By H. Percy Boulnois. London: Edwin Arnold. Pp. vii., 302. 16s. net.

The enormous increase in road traffic owing to the growth of the motor trade, the continual raising of the standards of weight and speed, and the prospect of a yet more extended use of our roadways to relieve the congestion of our railways all tend to give a greatly increased importance to the science of road construction. Many text-books on this subject have been issued in the United States, but the number of works by English authorities is small, and one of the author's purposes is to stimulate discussion of the problem in this country. Mr. Boulnois leaves the political and commercial aspects of the road traffic problem to others, and treats the subject from the point of view of the engineer concerned with the task of providing highways of sufficient strength to bear the stress of modern traffic, and of ensuring smooth, good-wearing, and as far as possible dust-free surfaces. The subject is not one of immediate interest to chemical industry, but many of our readers may find matter of indirect interest in the chapters on water-bound macadamised roads, the tar treatment of road surfaces, bituminous roads, and concrete roads. H.

Books Received

ELEMENTARY PRACTICAL CHEMISTRY. Part I. General Chemistry. By Frank Clowes, D.Sc., and J. Bernard Coleman, A.R.C.Sc. Seventh Edition. J. & A. Churchill, London. Pp. 241. 6s.

THE PREPARATION OF ORGANIC COMPOUNDS. By E. de Barry Barnett, B.Sc. With 54 illustrations. Second Edition. J. & A. Churchill, London. Pp. 273. 10s. 6d.

A TREATISE ON QUALITATIVE ANALYSIS. By Frank Clowes, D.Sc., and J. Bernard Coleman, A.R.C.Sc. Ninth Edition, with 84 illustrations. J. & A. Churchill, London. Pp. 400. 12s. 6d.

ANGLO-AMERICAN OIL.—Interim dividend of 3s. per share (15 per cent.) from the net earnings of the current year, free of British income tax.

Chemical Engineering Group

Successful Second Conference at Newcastle: Reports of Papers and Discussions

THE second conference of the Chemical Engineering Group of the Society of Chemical Industry was held on Monday, in the Chemical Department of the Armstrong College, Newcastle-on-Tyne. The conference, which was divided into an afternoon and an evening session, was attended by representative men in the industry from all parts of the country. The general subject for discussion was "The Transport and Distribution of Liquids in Chemical Works," and a number of Papers were read treating it from various points of view. They excited keen interest, and the proceedings continued to a late hour on Monday evening.

Professor Henry Louis' Welcome

The Chairman (Professor Henry Louis) said his first and agreeable duty was to welcome the Conference to Newcastle in general and to Armstrong College in particular. He had been charged by the Principal of the College (Sir Theodore Morison) to say how greatly he regretted that previous engagements prevented him from attending to welcome the Conference. For his own part, he was pleased to see them up in Newcastle. It was not a lovely town; it was a dirty and grimy but a business-like town, and engineers, at any rate, should feel at home in the atmosphere of coal dust and smoke, which was a token of some measure of engineering activity. Newcastle had been the pioneer of not a few chemical industries in the past, and was still holding its own with most other parts of the country. In the College he was particularly glad to see them, for chemistry was the science to which they, perhaps, devoted most attention, and the Department of Engineering had made a well-merited reputation. They were, therefore, as fitting a body as any to receive and appreciate a visit from chemical engineers. When the much needed expansion of the College took place, as he hoped it soon would, he was very anxious that a home should be found for chemical engineering, or whatever term they might give the subject. He did not doubt that the authorities were giving serious attention to the matter. (Hear, hear.) He regretted to say that a telegram had been received from Professor J. W. Hinchley, chairman of the Chemical Engineering Group, stating that it was impossible for him to attend owing to illness, but wishing the gathering every success.

The subject selected for the Conference, Professor Louis continued, was one of the greatest importance to everyone connected with chemical engineering. The problem of elevating liquids was one of the oldest that engineers had had to solve. Some of the most ancient bits of engineering work in the world had been constructed for that purpose, and engineers had steadily given their attention to it until mechanical and particularly mining engineers might be said to have successfully solved the problem of pumping large quantities of water, and pumping to a great height. The simple problem of water pumping might be said to have been fairly well solved by mechanical engineers. The chemical engineers, however, had a more difficult problem before them. He was beginning to appreciate that mechanical methods must be introduced into chemical works. Chemical works had grown a good deal beyond their original design. Chemical works had grown chiefly by the work of the chemists themselves, but in some instances, especially in that district, engineering had been conspicuous by its absence. There had been, however, before the war a movement for the introduction of engineering into chemical works, which had been accelerated by the necessity of the past five years for intensive production. The price and the scarcity of labour was making it necessary for the chemical engineer and the chemical industry generally more and more to employ mechanical devices for doing work and abandoning what a shipbuilding friend called "man power and profanity." (Laughter.) For the special subject to be dealt with by the Conference the need was remarkably conspicuous. There was great difficulty in the problem of having to pump fluids that might be highly corrosive, of a high temperature, specially mobile, specially volatile, or containing solids in a state of suspension. The problem was one that differed from those in ordinary engineering. The solution had occupied some of the best brains in the country, and the way in which the problem had been attacked and the measure of success achieved was indicated by the specimens of chemical engineering before them, and would be further elucidated by the Papers to be read during the Conference.

Elevation of Acids by the Kestner Method

The afternoon Conference was opened with a Paper by Mr. J. Arthur Reavell, M.I.Mech.E., on "The Elevation of Acids by the Kestner Patent Automatic Elevator."

Mr. Reavell said the object of the Paper was to describe the principles upon which the two standard types of Kestner Patent elevators worked. The first consisted of an elevator which worked intermittently. As soon as the elevator body was filled with acid, the acid was discharged by means of compressed air. The admission of the compressed air was automatic, and was controlled by a patent valve arrangement. The moment the body was filled with acid, compressed air was admitted through the valve in the valve box, and the acid discharged through the delivery pipe. Immediately the elevator was empty the air inlet valve was closed and the exhaust valve opened, and atmospheric pressure was at once restored. That allowed a further charge of acid to enter the vessel. That type of elevator could be obtained in pot ware, cast iron, regulus or, in fact, any material to suit the type of acid to be pumped. The object of the apparatus was to replace the ordinary hand-operated egg. The other type was the Kestner Patent Continuous Elevator, which delivered a continuous supply of acid against a given head, say, for the delivery of acid through jets or sprays. That was accomplished by means of a duplex body, each body filling and emptying alternately. The control of the air to the one body and the exhausting of the air from the other was effected by means of a simple device consisting of a rotary valve. The rotary valve was made in pot ware, and was so arranged that as soon as one body was full of acid compressed air was admitted, so that it immediately commenced discharging, and at the same moment the other body ceased discharging acid, and began to refill ready to come into operation. The automatic elevators should not be confused in any way with Kestner pumps, either of the plunger or centrifugal type.

Discussion

Capt. C. J. GOODWIN asked why Mr. Reavell had not given more information as to the actual working results. They were not so much interested in the description of the elevator as they were in the results obtained. He would like to know whether Mr. Reavell had made experiments in using compressed air expansively. It seemed to him that in the Kestner elevator there would always be a loss at the finish of the blowing period. He would like figures as to the percentage of air lost in that way, and some figures as to cost in £ s. d. of pumping liquids by an acid elevator would be very useful. He was also interested to know how the acid elevator compared with the air lift in actual practice. His own experience was that air lifts were very reliable, even though there was a little to give in regard to efficiency.

Mr. REAVELL replied that the difficulty in giving the information as to cost would be realised by those dealing with acid works. One could not get the average acid manufacturer to allow tests to be made. The figures in one's own laboratory did not help. The trouble was that the greatest difficulty was experienced in getting them to put the piping up right. If the pipes were put up right they would probably get a very high standard of efficiency with the use of compressed air. When the pipes were put up horizontally one was certain to get a loss of air. Regarding the differences of pressure required and available, one started at zero and when the balance pressure was reached the pressure slightly increased by about 10 per cent. Because there was 80 per cent. available to come on to the valve, 80 per cent. was not delivered but just sufficient according to the rate pumped. A reducing valve was not needed in his opinion. The acid elevator should not be filled slowly but quickly to get quick action. In any type tried one would get a certain loss of air.

Capt. GOODWIN asked if that was why they liked to pre-heat the air.

Mr. REAVELL replied that that was so. With regard to the air lift and the acid elevator, as one of the first to introduce the Bacon air lift from America, he thought there was no comparison in efficiency.

Mr. S. J. TUNGAY said that one difficulty had been the fact that

the engineering side did not meet the demands of the chemists. Twenty or thirty years ago it would have been impossible to get such articles manufactured as were seen there that day. As a matter of interest he added that, 15 years ago, he had seen centrifugal pumps made of stone. Despite the criticism of the old methods of pumping acid he thought there was still a great deal to be said for them. He had not adopted the Kestner type or similar types. One reason why he had not adopted such types was that, whatever the men were in other parts of the country, his experience was that to-day they were not willing to do the work of replacing the various parts. The plumbers objected to coming out specially to a job, and insisted that plumbers should be kept on the place at all times.

Mr. REAVELL said that so far as the question of splash was concerned they had a simple arrangement which ensured that there was absolutely no waste by splashing. With regard to the question as to whether the delivery pipe was exhausted every time, he replied that when the pipes were put in right there was no trouble whatever. Regarding the ability of the plumber to deal with the valve, he really thought it was not asking too much even of the modern plumber. (Laughter).

Capt. GODWIN regretted that Mr. Reavell could not give them the details of the work effected, but thought it would be a help to have some of the work's tests, even though the manufacturers did not care to give the information.

Mr. REAVELL said that the trouble in the works was that the plumbers or bosses did not put the pipes in properly. If they did that they would get 50 or 60 per cent. without any bother. In the re-use of air they had done a great deal of experimental work, but it was very difficult. When it got contaminated with various vapours there was great difficulty in using it. In reply to a question by Capt. Goodwin as to what he meant by 50 or 60 per cent. efficiency, Mr. Reavell said he meant if one put the air into the body one got 50 or 60 per cent. of the value of that air.

The Avamore "Squeegee" Pump

MR. R. A. PELMORE, in his Paper, said this pump was the invention of Mr. N. G. Beckwith, to whom credit was due for an original idea of great utility, which could not fail to be appreciated in the chemical industry, most particularly owing to the essential simplicity of construction. The outstanding requirements for pumping chemicals in addition to the usual desired features of good efficiency and high speed, were (1) reliability, (2) rock-bottom simplicity for rapid overhaul, (3) easily replaceable parts, (4) minimum corrosion and leakage, (5) positive action without priming.

Describing the operation of the pump, the author said it was a rotor consisting of a disc loosely mounted on an eccentric on the shaft rolls round the inside of the pump casing. No sliding took place between casing and rotor, but rolling motion was imparted to the rotor, which turned round the eccentric, the latter acting as a bearing. At the top of the casing a metal piece, usually with some spring tension behind, worked up and down in a slot, keeping contact at all times with the rim of the disc. Inlet and outlet ports were immediately to right and to left of this metal piece or valve. "Squeegee" action drove the liquid round in front of the rotor, which, being sealed from the auction side by the valve piece, was driven through the delivery port, while at the same time liquid followed behind the rotor through the suction port. This was the whole action of the pump.

The constructional simplicity and the restriction of principal wearing surfaces to bearings, as well as the absence of valves, without sacrificing the positive action or ability to run without priming, made a pump of extraordinary reliability. Such a variety of substance might be pumped that it would be futile to enter in detail into the materials used in the various instances. The pump in question had been sold for ammoniacal liquor, petrol, tar, creosote, linseed oil, whisky, port wine, milk, brine, sugar molasses, chlorine water. For strong acids, and other highly corrosive liquids, it was easily seen that this pump involved an upkeep in money and time less than any other positive pump known.

It is most unsatisfactory, in chemical works particularly, to have to prime a pump, and with the "squeegee" priming was eliminated even for suction lifts of 25 ft. and over. By the addition of a simple attachment in connection with the pump the delivery and suction connections remained the same for either direction or rotation. No valve, in the usual sense, was used, and the sliding piece separating suction and delivery had spring tension, but the pumps had been thoroughly tried without springs, and no difference at all had been noticed.

To sum up, this invention had produced the only high-speed positive pump which had no high-speed wearing surfaces, and these conditions were obtained, together with an excellent suction lift, without priming, these properties being achieved by the simplest design.

Arising directly from the principle of the pump described was a reduction gear of immense utility. In studying the relative and actual motions of the rotor of the "Squeegee" pump, Mr. Beckwith saw that, providing friction was sufficient to keep pure rolling motion of the rotor round the casing, the principle could be adopted to transmit power with almost any speed reduction desired. An experimental gear was constructed with the casing lined with ferodo, and the principle was found to be practical. However, it was highly desirable to make the gear positive rather than dependent on friction, and the tooth gears were substituted. The heavy and somewhat clumsy double reduction or even single reduction gears were superseded by this neat and compact design, and few engineers would adopt a worm drive after seeing this gear in operation.

Discussion

Mr. J. A. REAVELL said the Paper appealed to him as he had done a certain amount of experimenting on apparatus very largely on the same principle. The trouble then was a question of lubrication.

Mr. PELMORE said that in the ordinary way the lubrication was ordinary water lubrication. They had had one running six months and the wear was imperceptible. He dismantled the pump on view and showed how the cold water was sufficient. They had used them for pumping petrol and although less lubricating than water it lubricated itself. It ran at 1,000 revolutions per minute, or 1,000 gallons per hour. They had run it at 1,800 and the water film had been quite sufficient. In sea water they had successfully used a special metal for preventing galvanising action.

Mr. F. R. LOWE asked what was the clearance between the rotor. Many of those present had to deal with large quantities in which they were not certain that small bodies would not be in suspension. His experience was that under such circumstances pumps would not work on the sqeegee principle.

Mr. PELMORE said that they had run the pump on sandy water, and the tests were done without rubbers. He thought the rubber would deal with the sediment.

Mr. LOWE: Then you are going to have excessive wear.

Mr. PELMORE replied that if one kept on getting a good deal of matter in suspension it might affect the life of the rubber, but that would merely mean having to get it re-tyred. If constantly dealing with sandy materials it would be wise to provide spare rotors, and if one showed wear after a year or so, it could be sent away to be re-rubbered and the spare put on. The fixing of the spare was a very simple operation.

Mr. LOWE: Do you really think they would last 12 months?

Mr. PELMORE: I have no doubt about it from our experience with sandy matter. I stake my reputation on that. They had made careful and special tests in order to see that the pump would deal with liquids containing sediments. On the question whether with highly corrosive as well as sedimentary liquids it would wear so well, he would reserve his answer until experiments had been made.

Mr. F. CUNLIFFE said he had had experience with rotary pumps and found that whilst the pump might work well with hot liquids, it lost when working with cold liquids.

Mr. PELMORE suggested that in such a case the adjustment should be made to the highest temperature they expected to get.

Capt. GODWIN expressed the hope that there would be an addendum to the Paper on the figures of efficiency.

Mr. PELMORE said that regarding efficiency the small pump worked out at 55 per cent., but he believed that that standard of efficiency would be increased by a small motor running on high speed. The pressure on the glands affected the power so much that the readings were not within reasonable accuracy to give out the real efficiency. At present had he shown a curve of efficiency he would not have been satisfied with it himself.

Mr. H. JACKSON asked what was the greatest head used in the pump.

Mr. PELMORE replied that 183 ft. was the highest used, though they did not confine themselves to that. As it got beyond a certain point there was a certain amount od leakage as in every pump.

Mr. JACKSON feared that in pumping liquids with solids in suspension the pump would not last many hours.

Mr. PELMORE: We knocked that idea on the head before the pump was put before the outside public.

The CHAIRMAN said he thought that Mr. Pelmore had not given the answer that many required regarding wear and the questions had not been put too clearly. It seemed to him that the remarks with regard to excessive wear in the pump lost sight of the fact that Mr. Pelmore had demonstrated that the actual wearing part—the rotor—only revolved extremely slowly compared with the speed of the shaft and the wear was really very much reduced.

Centrifugal Pumps for Sulphuric and Nitric Acids

MR. S. J. TUNGAY, in his Paper on this subject, said that of all methods of lifting sulphuric acid, perhaps none had received greater attention at the hands of chemical engineers during the last few years than the adaptation of centrifugal pumps for this purpose. This was doubtless accounted for as a result of the difficulties encountered in the case of pumps of other types, mainly through valve troubles, whereas with the centrifugal type of pump there were no valves, and the parts subject to wearing action or friction were very small as compared with plunger type or reciprocating pumps. It is a well recognised fact that a small centrifugal pump would deal with very large quantities of liquid, whereas for handling the same quan-

tity of liquid by means of a plunger or piston type of pump, a machine of very much larger bulk would be required.

Another decisive factor which induced chemical manufacturers and engineers to regard favourably the improvements in centrifugal acid pumps was the very high efficiency which could be obtained by this means of lifting acid, as compared with the use of compressed air and acid eggs. In pumping acid by means of plunger type pumps, a very great danger always existed from the leakage of acid under pressure from the glands of the pumps. In the more modern types of centrifugal pumps, whether for high or low lifts, this trouble had been avoided by the glands having been so arranged that instead of being subject to pressure of acid, they were only subjected to a suction, and consequently only such packing was needed as would prevent any inlet of air whilst the pump was working.

The accompanying table demonstrated the working tests obtained from the working of these multi-stage or turbine pumps when dealing with sulphuric acid of sp. gr. 1·5. By increasing the stage of the multi-stage pumps to three or four stages, it would be seen that a corresponding increase in height of lift was obtained with, of course, a proportionate increase in consumption of power. In some of the larger sizes of these high-lift acid pumps more elaborate means had been devised to effect a high efficiency in working, and many installations were now working which show as high as 47½ to 55 per cent. efficiency.

Working Tests from Haughton's Multi-Stage Acid Pumps Lifting Sulphuric Acid 1·5 S.G.

Pipe connections ...	1½			2			3			4		
Av. cap. gal. per min. ...	27			44			155			220		
No. of stages	2	3	4	2	3	4	2	3	4	2	3	4
R.P.M. appr.	1,380			1,280			980			870		
Head in feet	22	32	42	22	32	42	22	32	42	22	32	42
H.P.	0·68	1·02	1·36	1·0	1·5	2·0	2·6	3·9	5·2	3·8	5·7	7·6
R.P.M. appr.	1,800			1,700			1,300			1,150		
Head in feet	40	60	80	40	60	80	40	60	80	40	60	80
H.P.	1·1	1·65	2·20	1·70	2·55	3·40	4·8	7·2	9·6	6·6	9·9	13·2
R.P.M. appr.	2,160			2,040			1,560			1,380		
Head in feet	56	84	112	56	84	112	56	84	112	56	84	112
H.P.	1·44	2·16	2·88	2·30	3·45	4·60	6·4	9·6	12·8	9·0	13·5	18·0
R.P.M. appr.	2,460			2,320			1,770			1,580		
Head in feet	74	110	146	74	110	146	74	110	146	74	110	146
H.P.	1·90	2·85	3·70	3·1	4·6	6·2	8·8	13·2	17·6	12·0	18·0	24·0

A centrifugal pump which had been remarkably successful for pumping nitric acid was constructed entirely of "Ironac" acid-resisting iron, with the exception of the bed plate, and possessed some rather unusual points. He believed it to be one of the only pumps, apart from earthenware or pottery pumps, in use for nitric acid and nitro bodies. The use of this pump for nitric acid was early recognised by Mr. K. B. Quinan, who had some of them installed for lifting nitric acid at the Government explosives factories. Some of these small pumps fitted at the Greetland Factory raised 85 per cent. nitric acid to a height of 60 ft. continually at temperatures up to 125°C. Five pumps which were fitted pumped 22,000 tons of nitric acid without any money being spent upon them for maintenance. The subjoined table shows the capacity, the output and the power required for this pump when lifting nitric acid at different heads :—

Ironac Pumps.

Height of lift	7 ft.	13 ft.	20 ft.	26 ft.	33 ft.
Revs. per min.	875	1,250	1,510	1,766	1,955
Galls. per min.	15	20·6	25·4	30	33
H.P. required	0·091	0·23	0·375	0·55	0·71
Height of lift	40 ft.	46 ft.	52 ft.	59 ft.	66 ft.
Revs. per min.	2,160	2,320	2,480	2,630	2,770
Galls. per min.	36·5	39	42	45	47
H.P. required	0·96	1·23	1·54	1·87	2·24
Height of lift	7 ft.	13 ft.	20 ft.	26 ft.	33 ft.
Revs. per min.	950	1,340	1,620	1,890	2,120
Galls. per min.	25·6	36	43	51	57
H.P. required	0·19	0·44	0·67	0·95	1·21
Height of lift.	40 ft.	46 ft.	52 ft.	59 ft.	66 ft.
Revs. per min.	2,310	2,490	2,670	2,840	2,990
Galls. per min.	62	66·5	71	76	80
H.P. required	1·63	2·08	2·62	3·21	3·82

Discussion

Capt. GOODWIN remarked that the author had said that nitric acid was pumped at 125°C. That was above boiling point.

Mr. TUNGAY: I am sorry. It should, of course, have been Fahrenheit. They had many pumps, he said, working nitric acid with a head of 85 ft. and they had no trouble with leakage. With the grooves used the actual pressure reaching the glands was very slight. He found no difficulty with leakage when the pumps were lying idle.

Mr. JACKSON said that his experience, though not with that particular pump, was just the reverse. He had always considerable trouble with the glands.

Mr. TUNGAY said they had made special provision against that. With the old type of pumps considerable leakage occurred at the glands, but with the modern plant the glands were not subjected to the same pressure. There was no fear of leakage under modern conditions.

In reply to Mr. S. A. WIKNER, Mr. Tungay said he had used the centrifugal pump for copper sulphate, and other liquors with crystals, and had no difficulty at all. With a considerable clearance he had been able to pump even small stones and gritty water without trouble.

Mr. A. RUDGE asked whether iron was suitable for the centrifugal pump. He had known the propellors of centrifugal pumps to get very brittle and break off.

Mr. TUNGAY replied that if he was referring to cast-iron, it was a very ambiguous quantity nowadays.

Mr. REAVELL remarked that just before the war Mr. Kestner had patented and developed a direct-action pump with a definite clearance and it was a perfect success. The leakage was one or two drops per hour. He knew the metal was all right, as Mr. Tungay had made it. (Laughter). The pump was so successful that the Germans, when occupying Lille took two truck loads of them to Germany, the whole of the patterns and all the detailed drawings.

Mr. TUNGAY said he looked forward to a happy future in the days of the millennium of acid pumps when they would have a satisfactory plunger and piston pump.

Professor Bedson

After an informal dinner at the Central Station Hotel, the evening Session was opened under the presidency of Professor P. P. Bedson, of Armstrong College.

Professor BEDSON welcomed the conference to Newcastle and to the College, and said though he did not claim to be a chemical engineer, he had taken a great interest in the group since its formation. While fully appreciating the importance of chemical engineering, chemistry, too, was very important, and he did not want to see one science, or branch of the science, overshadowing the other. Chemistry was the branch with which they were most concerned. So many were the applications of chemistry that it was impossible for one man to have a knowledge of them all. When they came to chemical engineering there was a danger in the idea that a man could be educated as a chemical engineer between the ages of 17 and 21. When he remembered that a chemical engineer should first be a chemist and then an engineer, more time should be devoted to his education than was usually devoted in this country. When he remembered that a man should be first taught to think chemically, then mechanically, then electrically, and then financially, and that he should go to college at the age of 17, he wondered when he should leave college (Laughter). If in three years he succeeded in teaching a man to think and feel chemically, he considered he had done well for him. He wished to express the great satisfaction it was to him to take even a small share in their conference. He again welcomed them on his own behalf and on behalf of the Council of the College, and if ever they came to Newcastle again there would be a welcome from himself and the Council or their successors. (Applause.)

A little later Professor Bedson vacated the chair, and Mr. George Sisson took his place.

The SECRETARY (Mr. H. Talbot) proposed a hearty vote of thanks to Professor Bedson for the trouble he had taken to attend the evening session, and coupled with it the name of Mr. Dunford Smith, the local secretary of the Society of Chemical Industry. Both, said Mr. Talbot, had worked hard to make the conference a success, and without their aid he would have been greatly handicapped.

The Marclen Pump

In a Paper on "The Marclen Glandless Acid Pump," Mr. R. A. Stewart pointed out that that well-known piece of plant, the "Acid Egg" had served a very useful purpose for several generations, and it was still to be met with in the great majority of sulphuric acid works. Its great drawback was the cumbrousness of the whole plant of which it formed a part, and in addition to this, it had the inherent defect of being intermittent in action. To overcome this, several very ingenious automatic acid elevators had been devised, operated by compressed air, and these were successfully working in a large number of plants and dealing with a wide variety of acids and other liquids. The ordinary ram or force pump, and the double action piston pump had met with a limited application in connection with the handling of acids, for which purpose they were made in some acid resisting materials such as earthenware, ebonite or antimonial lead, and, latterly, in silicon iron alloys. Except for such modifications necessary to fit them for these uses, the ram and piston pumps were in all essentials just what they were a century ago. The centrifugal pump, on the other hand, had, in a comparatively short period, gone through a process of evolution which was most remarkable, and was met with to-day in a myriad different forms. Possibly,

the elimination of valves, which were a more or less troublesome feature in other types of pumps, had been one reason for this marvellous development.

In view of the convenience, compactness and small number of working parts of the centrifugal or rotary pump, it was not to be wondered at that it had been for some time past adapted for the purpose of elevating acids. There were now several well-known makes in acid resisting materials on the market, and many of these were of a high degree of excellence, and showed a considerable amount of ingenuity in design. Most of these pumps, however, had one common defect—namely, a *gland*. It was after a wearisome and costly experience with various makes of pumps in regulus and so-called acid resisting bronze, and delays, stoppages caused by the destruction of the packing and consequent leakage from stuffing boxes, that the "Marclen" pump was devised.

The Marclen Pump

This pump possessed certain features in common with other centrifugal pumps, but differed from them in being glandless. Essentially, it consisted of a casing and a rotor or impeller with a vertical spindle. This was a departure from the usual practice, as, of course, most centrifugal or rotary pumps had horizontal spindles. This method of construction had been adopted in order that glands might be dispensed with, and it would be admitted by all who had had experience in the actual working of acid pumps that this was a great desideratum. Delay, expense and other inconveniences in connection with the packing of glands were avoided. Moreover, friction was obviated, and this in itself was a great advantage, especially in the case of pumps made in regulus or stoneware.

With all direct motor-driven pumps particular attention was given to the proper insulation of the motor from the pump by means of (*a*) vulcanised fibre sheets between the foot of the motor and the brackets on the pump framing; (*b*) thimbles and washers under the bolts securing the motor to the pump framing or brackets; (*c*) insulating the flexible coupling. The foregoing description applies more particularly to the Marclen pump specially intended for elevating sulphuric acid.

But by a comparatively small modification of the design the pump was equally well adapted for raising other acids such as nitric, hydrochloric and acetic acid. For such purpose the pump is made in ebonite, earthenware or silicon-iron alloy, or even in stone. As a matter of fact these pumps have been working for over two years with various corrosive liquids, including concentrated and dilute sulphuric and phosphoric acids and hydrochloric acid. Also very strongly alkaline liquors, at the boiling temperature containing a heavy sediment mixed with ashes.

The following were some of the uses for which the Marclen pump was well adapted: The elevation of hot saline solutions to crystallising vessels; the removal of salts deposited from solutions undergoing evaporation; the emptying of caustic soda or sulphide of sodium finishing pots; mixing liquids and solids in dissolving tanks; employed for this purpose, either outside or immersed in the dissolver itself, the Marclen pump imparted a vigorous agitation to the contents of a relatively very large vessel.

Discussion

Mr. TUNGAY inquired whether Mr. Stewart had experienced any difficulty owing to the large diameter of the valve seat, which had to be secured at the top end of the float. He had described a certain amount of revolving motion by the float, and it appeared to be one of the weak points. He also thought that Dr. Lunge had described a similar pump suspended vertically in a tank of acid.

Mr. STEWART said that the pump had not yet been made with the particular valve in question, but it was working quite successfully in its original form. He had not seen anything like the Marclen pump, but after Mr. Tungay's remarks he would certainly look it up. When the pump was first made there was certainly no difficulty in getting a patent.

Mr. REAVELL said that it seemed to him that, with the exception of the float, the pump was practically the same type as one already constructed. During the war Mr. Kestner built a large number of pumps of that type, the difference being in the float. He was rather at a loss to know what the float was for. If it was to relieve the footstep bearing what was the use of the thrust bearing? If it was not, he did not quite see the object of the float.

Mr. STEWART said the thrust bearing and collar under the bearing was simply to prevent the vertical movement. The office of the float was to deal with a big head of acid, which might be so great as to give the pump too much to do. He was not aware except for what he had heard that night that there was any pump on the same lines in use in the chemical industry.

Mr. H. M. RIDGE remarked that he had used something like the same sort of thing before the war for the circulation of weak acids which had certain particular difficulties about them. He had intentionally made the bottom of the rotor flat, and achieved excellent results. It was not the same type of float as in the Marclen pump.

Mr. W. HAYHURST asked whether Mr. Stewart had seen the vertical pumps used by the Ministry at Queensferry. He saw a large number there about three years ago. They were made differently from the Marclen pump, but the essential features were the same.

Mr. STEWART replied that he had not seen or heard of them.

Capt. GOODWIN thought that in the discussion they were not quite doing justice to the design of the Marclen pump. The mere fact that it was on the market as a commercial proposition was something. Certain pumps of a similar character had been used in South Africa and America, but they were not exactly the same design. He thought the fact that the patent had been granted was sufficient on the point. Regarding the question of mixing, he mentioned that he had made use of a centrifugal pump for neutralising the contents of a large vat by drawing the liquid from the bottom of the tank and distributing it by a feed pipe. He reduced the time for neutralising the contents of the vat by one-quarter of the time taken by the ordinary stirring gear.

Mr. Stewart drew a sketch of a pump which he had seen in Germany recently when on a chemical mission. In the report issued on the mission it was erroneously stated that the pump was used for sulphuric acid. For the benefit of those who had seen the report he might state that the pump was really used for circulating water.

General Types of Pumping Machinery in Chemical Works

Mr. J. H. West, A.C.G.I., A.M.Inst.C.E., in a contribution on this subject, gave a comprehensive survey of pumping and elevating plant used in chemical works, classified as to types, and more particularly as to uses, actual and possible. Working data were given, and the Paper was illustrated by diagrams, photographs and lantern slides. He hoped at a later date to enlarge on the subject and provide a complete Paper.

Among the more unusual items of plant described by Mr. West were the following:—

The Premier diaphragm pump, which was described as of the vertical type, belt-driven through spur-reduction gear, and particularly suitable for handling gritty liquors when made of cast-iron, while for dealing with corrosive acids the parts in contact with the acid were coated with lead or ebonite. The plunger worked in water and the diaphragm was made of rubber from $\frac{3}{4}$ in. to $\frac{1}{2}$ in. in thickness. Rubber-coated ball valves were provided. The pump he said, could be run at a constant speed, the surplus liquor not taken by the press being returned to the suction tank through the relief valve. These pumps were not suitable for liquors at temperatures above 55°C., on account of the rubber diaphragm.

The Ogden automatic acide elevator. This, he said, consisted of a receiver made of "Vitreon" acid-resisting stoneware, and was made in two sizes, capable of handling 400 and 800 gallons per hour respectively. The operation of the elevator was as follows: As the acid ran into the receiver, the displaced air escaped into the discharge pipe by a small hole just below the top flange. When the level of the acid rose above that hole, no more air could escape, and a slight compression of the remaining air took place as the acid continued to rise. That compression acted upon a fairly large rubber diapraghm placed on a chamber at the top of the air compression pipe, and just lifted the valve, which was attached to the piston, off its seat sufficiently to allow a little compressed air to enter the piston chamber and through it, the receiver, thus starting the liquid in motion gently and without shock. The pressure of the compressed air on the diaphragm opened the air admission valve fully and the acid was then blown out. As soon as the last of the acid began to leave the discharge pipe, allowing the air to escape with it, the pressure in the receiver fell and the weighted lever at the top of the apparatus closed the air valve by acting on the piston through the rubber diaphragm, but only upon the very small area of the valve the weight of the piston was sufficient to hold the valve closed. There was a slight space between the lower setscrew and the diaphragm setscrew sufficient to allow the valve to lift off its seat under the slight compression of the trapped air in the receiver.

Mr. WEST also described by the aid of lantern slides the Ogden automatic pump trap, and the Sullivan air lift, which gave an efficiency ranging from 30 to 35 per cent.

Discussion

In the discussion which followed, Captain GOODWIN said he was glad that they had had at last a Paper which dealt with efficiency, and noted with pleasure that Mr. West was to develop the subject later. Mr. West had shown that the air lift had, to say the least, some possibilities. They had been told that the average centrifugal pump averaged 50 to 70 per cent. efficiency. He described a method adopted in two large acid plants on the Continent and in America. The quantities were very large, about 200 tons per hour for each unit, and the method was simply a passenger lift, and, after all, the efficiency of the ordinary mechanical lift was 80 per cent. or more. It had not come into general use in chemical works, but it was justified in such large plants as he referred to. Another method was the use of a vacuum for moving liquids. On the face of it it might seem rather irrational to use the vacuum, as it was more efficient to compress air. In certain cases, however, it gave advantages due to the absence of floats. He had used it successfully in explosive works. In its simplest form it would consist of a receiver and suction pipe dipped into the tank with a suitable non-return valve on the suction pipe. The possible head was limited to 30 ft. in the case of water or heavy liquid. The use of vacuum had

considerable advantages in the moving of liquid from one vessel to another in the course of continuous processes. In connection with the distribution of liquids in chemical works he would like to urge the necessity of paying more attention to the standardisation of distances between cocks and valves to facilitate replacements and reduce the number of spare parts to be kept in stock. Again, the pipe lines ought to be painted in distinctive colours; in some Government plants that had been done. The great need was for a standard colour to be used in all works, otherwise men changing from one works to another might be liable to cause accidents. The capacity of storage vessels ought to be standardised and the flange connections to the various pumps, so that when a pump gave out it would be an easy matter to replace it by a pump of another make about the works.

Mr. REAVELL pointed out that the lecturer had got the impression, when he (Mr. Reavell) earlier said that the acid should be pumped quickly, that all the Kestner elevators had to be filled quickly. That was not so; they had more than one type, and some could be filled extremely slowly.

Pumping Acids and Other Corrosive Liquids

IN a Paper by Mr. W. Hayhurst, on "Pumping Acids and other Corrosive Liquids with Particular Reference to the Armoured Ceratherm Centrifugal Pump," it was pointed out that certain qualifications must be provided for. If possible there should be no rubbing surfaces or bearings within the pump; there should be no material touched by the corrosive liquid passing through the pump which could be dissolved or affected by that liquid; valves cause wear and tear, required frequent attention, and should be avoided if possible. Any oil used should not come into contact with the corrosive liquid, accidents fatal not only to the pump having been traced to such conditions. The pressure developed by the pump should be easily variable from zero to about 50 lb.—60 lb. The greatest importance should be attached to the simplicity of the apparatus used. The heads or pressure developed by the pump should be accomplished at comparatively low pressures. The type of pump, it was claimed, which fulfilled the requirements of the chemical trade was the centrifugal.

What materials were available to the chemical engineer for manufacturing centrifugal pumps? Enamelled ware was out of the question, because the slightest scratch would terminate the life of the pump. There were two factors in the choice of material. One was corrosion and the other erosion. The latter factor would probably make it impossible to use enamelled ware pumps, however carefully fitted. Ebonite pumps were not suitable for hot liquids, and the number of corrosive liquids on which they could be used was strictly limited—*e.g.*, liquids containing chlorine. They had the disadvantage, moreover, that any rubbing surfaces—at the gland, for example—were liable to seize owing to the local heating so rapidly generated by any friction. The pumps manufactured from ferro-silicon or other alloys had only a very restricted application, being unsuitable for hydrochloric acid, also any process where contamination by iron would be detrimental. They were unsuitable for many solutions containing metallic salts, and for many warm, weak mineral acids when they contain traces of impurity. They were quite unsuitable for most organic acids, and there was considerable difficulty in making suitable pump castings.

Lead and regulus metal, of course, was very strictly limited in their application, and were unsuitable for many acids and for solutions containing metallic salts. Such expensive metals as gold and platinum would not be insoluble in all the acids and liquids met with in chemical practice, and the factor of erosion might be very serious. Such manufacture, however, would not be altogether out of the question because centrifugal pumps with impellers of very small dimensions, say, of only two or three inches diameter, could be made which would lift to any head required in the chemical works, as much as 700 ft. head having been obtained by these small impellers. But the difficulty of high speed in the neighbourhood of 10,000 revs. per min. as well as cost, discounted the possibilities in this direction although they were rather interesting. Providing that it could be obtained in suitable forms, ceramic material offers the largest possibilities for the construction of pumps for the chemical trade. Ceramic material could be obtained which is quite insoluble in almost any corrosive liquid. The hard nature of the product also reduced wear due to erosion to the minimum.

The type of ceramic material chosen by the writer for his pump was a form of ceratherm. Ceratherm was a new acid-ware, prepared during the war for rapid condensation of large quantities of acid gas in the manufacture of explosives. It had useful properties which made it suitable for this work in that small articles could be heated to a red heat and plunged into cold water without cracking, and it conducted heat much more quickly than ordinary stoneware, thus enabling an equable temperature to be maintained throughout any apparatus into which it was made. A blow on a piece of ceratherm did not produce the same shattering effect as on a piece of glass or a piece of highly vitreous stoneware.

The type of ceratherm used for the manufacture of pumps, however, was not the same as that used for the manufacture of Hart's Nitric Acid Condensing Plant, for instance, used in the manufacture of explosives, but a type was prepared with considerably increased tensile strength.

The Paper went on to describe the Guthrie ceratherm pump.

Discussion

Mr. RUDGE remarked that it seemed to him that most of the types described needed a separate motor. He thought there was a lot to be said for having one motor in an establishment.

Mr. RIDGE said he had the reputation of throwing bricks at people, but on this occasion he wished to congratulate Mr. Hayhurst. Mr. Hayhurst had emphasised the tensile strength of his material. That was not a theoretical question, and he would like some information on the tensile tests not done on fragments cut, ground or sawn, but real practical tests. Another point was the heat difference. He had given some references to the heating of a vessel with a metal outside lined with ceratherm. In order that that could be done it was obvious that the metal should have something close to the co-efficient of the ceratherm. He noticed that a steel vessel was used. He would like some information as to whether the expansion of the ceratherm was identical with the cast iron or mild steel, whichever was used. Another point he would like to hear more about was the conductivity. He noticed with interest that the author most glibly talked of ceratherm, but another learned society had discussed the pronunciation of the word. (Laughter.)

Mr. HAYHURST said that regarding the tensile strength figures were not easy to give, but in his opinion the proper way to get an idea of what ceratherm would stand was to run it until it burst, and they would get the tensile strength.

Mr. REAVELL said that if that was done the thing would get out of balance sooner or later, and the thing might go off on account of vibration.

Mr. HAYHURST said he thought they were asking what would happen in practice, and in practice it would go out of balance. He had not succeeded in bursting one yet. He had given a figure of 3,000 revolutions for the larger impellers, and that gave a safety factor at once of four or more. He did not think there was any other really reliable way of getting a figure. After all the question was—How do they work and how do they stand up in use? He could say that they had run impellers faster than they ought to and they did not break. With regard to the heat transmission he had not space in the Paper to go wholly into that question. The transmission of heat was based on figures from actual practice, using a lead coil. It was in use and transmitting heat quite satisfactorily. He had not yet had an opportunity of taking accurate readings. So far as the question of linings being effected by different coefficients was concerned, the linings were fluted on, and they had never had one come off in use.

Votes of Thanks

The CHAIRMAN said that they were all very grateful to the authors of the Papers for the information they had received from the Papers and from the discussions. Personally he had enjoyed the meeting very much, and it was a great help to manufacturers to hear such points discussed. The problems were difficult ones, but he believed they were on the way to being solved. He asked them to join in a hearty vote of thanks to the speakers.

The SECRETARY, in moving a vote of thanks to the Chairman, mentioned that a letter had been received from Sir George Hadcock wishing the gathering every success, and regretting his inability to be present. He also referred to the message from Prof. Hinchley, and added that they would all regret to hear that he was suffering from the effects of overwork, and had been ordered to take a long holiday. It was decided to send a telegram to Prof. Hinchley sympathising with him in his illness, and wishing him a speedy recovery.

Captain GOODWIN moved a vote of thanks to Mr. Talbot for his work in making the conference a success. He knew it had meant three or four weeks of very hard work. They desired to express their deep appreciation of his work, and he hoped they would help to lighten it in the future.

The SECRETARY said that anything he had done had been more than rewarded by the success of the Conference. He would continue to put his best efforts into furthering the work of the group. (Applause.)

The Conference then closed.

The Affairs of Perry, Mills & Co.

AN adjourned sitting for the public examination of Perry, Mills & Co. (trading as) A. H. Duke and Henry Slater), 61-62, Gracechurch Street, E.C., was held on Tuesday, Dec. 9, at the London Bankruptcy Court, before Mr. Registrar Mellor. An amended statement of their affairs showed gross liabilities £37,783 11s. 4d., of which £14,911 15s. 7d. was expected to rank for dividend, against net assets valued at £2,942 12s. 6d. The firm's business had consisted chiefly of the export to the Continent of chemicals (drugs, dyes, &c.). The debtor (Duke) had also been interested in the formation of a margarine company, and had acted as director of an oil refinery company.

The examination of both debtors was concluded.

Synthetic Nitrate

To the Editor of THE CHEMICAL AGE

SIR,—Referring to the remarks in your last issue under "Nitrate and Labour Unrest," concerning the tendency to disparage synthetic nitrate one would scarcely have expected it to be necessary at the present day to make any special defence of the value of the synthetic nitrate products for fertilising purposes. The only conceivable factor that could render them less effective than the "natural" product as fertilisers would be the presence of injurious impurities. As a matter of fact, however, the Norwegian synthetic products are really characterised by their high degree of purity. The Norwegian nitrate of soda, for example, is ordinarily of 96·198 per cent. purity, thus comparing favourably with the Chilian product, while it can be manufactured approximately 99 per cent. pure.

The nitrate of ammonia from the same synthetic source actually exceeds 99 per cent. in purity, testing about 34·8 per cent. nitrogen, while nitrate of lime is practically 98 per cent. pure, containing 13 per cent. nitrogen.

So far as the agricultural value of these products is concerned, the experiments both in this and in the Scandinavian countries, in particular, have conclusively shown that unit for unit of nitrogen they are at least equally as efficient as the "natural" nitrate. In this country the experiments have actually demonstrated that on soils lacking in lime nitrate of lime is even more effective than nitrate of soda. Consequently, on the average of all the comparative official field trials in Great Britain, extending over a series of years crops and soils, this particular combination of synthetic nitrate has really proved to be a more efficient source of nitrogen than the "natural" one.

The experimental evidence in this country in regard to the fertilising value of nitrate of ammonia will be found summarised in an article by Dr. E. J. Russell in the February issue of the current year of the *Journal of the Board of Agriculture*. This clearly shows that, weight for weight of nitrogen, nitrate of ammonia is likewise equal in fertilising efficiency to either of the standard forms of combined nitrogen.—Yours, &c.,

The Nitrate Trading Co., Ltd., G. A. COWIE, M.A., A.I.C.
41, Eastcheap, E.C.3.

[We are glad to note that our correspondent has taken advantage of the suggestion we made that those who can speak with authority as to the value of fixed nitrogen should take every opportunity of publishing their experience.—ED. *C.A.*]

Association of Industrial Chemists

(FROM A CORRESPONDENT.)

THE National Association of Industrial Chemists—an Association specially concerned in safeguarding the interests of analytical chemists—is progressing favourably. At the recent meeting of the Executive Council a further increase in membership was reported and the Association has now appointed a full-time assistant secretary. It has also been registered under the Trade Union Act and is the only body representing analytical chemists in the United Kingdom which is so registered. With the new powers thus granted to it, the Association anticipates a considerable increase in its influence and in its ability to assist the economic condition and professional status of its members.

Its educational work is steadily developing. A series of lectures by Dr. F. Rogers to the Sheffield section was very largely attended. The annual dinner of the Sheffield section was also a great success, over 100 being present. The feature of the evening was a speech by the Chairman (Mr. A. C. J. Charlier) on the omission of chemists, engineers, technical managers, inspectors and supervisors—in short, the brain workers—from the joint councils formed under the Whitley scheme and the necessity for all such men to federate in order to secure adequate representation on these councils. The annual dinner of the Birmingham section, at which the chief speaker was the hon. secretary of the Association, was also a success; about 30 members were present and a smoking concert followed the dinner.

Special arrangements are being made to give isolated members an equal share in the management of the Association with those who belong to a local section.

Salters' Institute of Industrial Chemistry

FOR the first time since the outbreak of war, the members of the Salters' Company met at the Hall as a body on Thursday, December 11, a dinner being given in honour of the newest departure of the Guild—the Salters' Institute of Industrial Chemistry. The Master, Mr. W. B. M. Bird, presided, and among those present were: Sir James J. Dobbie (President of the Chemical Society), Mr. John Gray (President of the Society of Chemical Industry), Lord Moulton, Sir W. J. Pope, Lord Cheylesmore, Mr. P. L. Hall and Mr. G. Everard Nichols (the Clerk). The Master, in giving the toast of "The Salters' Institute of Industrial Chemistry," said that they must all lend their efforts to revive the prosperity of the trades with which their names were associated. They must look to the future if the country was to escape financial disaster. The Guilds must encourage trade and industry in every direction. The Salters' Company had determined to support commercial chemistry. When the war broke out, the home of commercial chemistry was in Germany. In the early days of the war that resulted in a lamentable state of affairs. Therefore, the Company had decided, on the invitation of the Minister of Reconstruction, to foster the trade. It had been determined to assist chemists to continue their education, and to help embryo chemists. They had founded an Institute—not of bricks and mortar—and believed it would result in a return for every penny expended. They had founded 12 bursaries of £250 a-piece, and the progress of the holders would be carefully watched by the Directors. In addition, they had given bounties to some 30 or 40 working men who desired to improve their position. Dr. M. O. Forster (Director of the Salters' Institute), replying, pointed to the efforts of the other Guilds in a similar direction—the Clothworkers, the Skinners, and the Leathersellers—and said that the Salters' Company had already played its part in the joint effort of the Guilds through the City and Guilds' Institute to assist trade. That organisation had spent a million in the cause of education, and of it the Salters' Company had provided between £40,000 and £50,000. The results had been magnificent. There was no difference between pure and applied chemistry except in one case you chose your problem, and took your own time, and in the other the problem was set and time was of importance. The toast of "Science and Industry" was given by Mr. Warden Cancellor, and Sir W. J. Pope replied. He said that the panacea for our difficulties was to be found not in State control, but in the utilisation of such organisations as the Salters' Company.

Alcohol From Coal

MR. ERNEST BURY, of the Skinningrove Iron & Steel Works, in a Paper read before the Cleveland Institution of Engineers, at Middlesbrough on Monday, showed that at his works he had succeeded in extracting ethylene alcohol and its derivatives from coke-oven gas on a commercial scale.

The practical working of Mr. Bury's process at the Skinningrove Works, where 5,800 tons of coal are carbonised per week, has revealed an average yield of 1·6 gallons of alcohol per ton of coal carbonised, and as the total weight of the coal which was reduced to coke in this country in 1918 was 14,635,000 tons, the application of this process to the whole of this coal would yield, according to Mr. Bury's calculation, 23,416,640 gallons, the value of which would be £2,341,664. Having regard to the scarcity of liquid fuel, Mr. Bury further pointed out that the recovery of the alcohol at the gasworks of the country would yield a further 27,000,000 gallons, or, taking alcohol and benzol together, the total quantity of liquid fuel available from extraction through the carbonising of coal would be 114,000,000 gallons, to meet the country's present total requirement of 160,000,000 gallons per annum.

The process of extraction by contact with sulphuric acid is not a new discovery, but Mr. Bury has been the first to show its commercial practicability. His principal discovery is that the best results are achieved at a temperature of 60°C. to 80°C., and in his process he has carried the utilisations of heat from the coke-oven plant to the utmost limit. Ether, chloroform, iodoform, acetic acid and acetone are among the derivatives he has obtained from this coke-oven gas after the benzol has been extracted.

Restrictions on Chemicals

BY an Order in Council, dated December 16, a considerable number and variety of the articles, including scrap iron and scrap steel, which had been retained on the prohibited lists, may now be exported freely without licence. On the other hand, the following chemicals are placed on the prohibited list, and licences are required for their export to any destination: Benzol and its compounds and preparations, dimethylaniline, meta-cresol, methylaniline, and para-cresol. Licences are also needed for the export of copra, cotton seed, groundnuts, linseed, palm kernels, and soya bean, cake, meal and flour.

The Chemist's Relation to the Manufacturer

By John W. O'Leary*

(*President of the U.S. National Metal Trades Association*)

WE are facing a very critical and serious situation in the United States. I always try when thinking of the great war to dwell not so much on its cost in money, in health, in sacrifice or in loss of life, but more on the gain to the world. We would be showing small appreciation and little reverence if we now only devote ourselves to acknowledgment of our debt by erection of memorials to those who won the war. The cost was too great, the struggle too long, to be content with such expression. We should rather feel the duty ours to honour them by accepting as our task the rebuilding of the world resources destroyed, the conservation of the resources remaining, and the preservation of the lessons taught by experience.

To the men of the chemical industries comes the opportunity to lead in these tasks. The war brought to all of us a realisation of their value in almost every branch of industry. One of the oldest of professions has come into its proper sphere of importance. For, during the war, whether the need was a greater destructive explosive, a more danergous gas, a more brittle or a more ductile steel, the science of chemistry was the agency to which we looked. Or if the demands of armies called for more cloth or wood or paper or leather or silk, or anything which natural resource or productive capacity could not supply, the chemist was called on to create the substitute.

Now when we are realising the effect of interrupted production and of wholesale destruction, the economic cost and the difficulty of supplying even our current needs when it is essential that we should restore the lack in these years of war before equilibrium can again exist, what an opportunity is yours to serve the world! The awakening of industry in general to its need for your assistance was marked during the years immediately preceding the war. The twentieth century began with such an appreciation.

Chemistry in the Steel Industry

I have been interested all my life in the steel industry. I have heard my father speak often of the shipment of steel rails to the United States from England during his early manhood, and the excitement over the discovery of the Bessemer process. I have watched with interest the later development of the open hearth, and the impetus which that development gave to the industry. But it was not until the chemical engineers developed the use of alloys in steel, and the magic effects of heat treatment, that the full possibilities of the steel industry became apparent. To-day the chemistry of steel makes us feel that no matter what phenomenal results have been demonstrated recently, more phenomenal results will occur, and that there is no more important factor in the further development of the steel industry than chemistry.

It is not sufficient that you have improved materially the quality and uses of steel; you have been developing at the same time the by-products, which for so many years were wasted. In so doing, you are making us independent of Germany and her tar compounds and adding materially to the wealth of the United States. It is noticeable that while almost every commodity has increased in price since the Armistice, steel has been reduced, and that in spite of higher costs in actual production of the steel itself. This has been made possible largely through the utilisation of the by-products. It is entirely within the realm of possibility that the by-products of steel manufacture may bring profits equal to those of producing steel. Whatever the gain, it will mean much to the future prosperity of the United States.

To-day, we are the only great producing nation in position to carry on normal industry through finance, natural resource and comparative immunity from destruction of life from the war. While we are not taking full advantage of our position, because of industrial strikes, we will recover quicker than others. Eventually, however, we must meet competition which will demand the keenest efforts. The further we advance in utilisation of our by-prodcuts the better we will meet whatever the balance of the world offers in competition. What has been accomplished in the steel industry is indicative only of the importance of chemistry in almost every basic line. The extravagant, wasteful methods which we employed in the use of our forest resources is forcing attention now. Through the use of preservatives we must conserve what we have left; and it is your province to develop those preservatives.

The importance of the growth of the chemical industry in the basic field of chemicals, drugs and dyes, is clearly shown in the comparison of our export figures for those articles in 1913 and 1917. Our imports from Germany in 1913 amounted to $21,000,000. Our exports in 1913 to all countries were $30,000,000, while in 1917, partly due to higher prices, but still representing a large increase in volume, our exports amounted to $188,000,000. Surely no other American industry can show such a ratio of increase.

Industrial Patriotism

But what of the preservation of industry itself? It seems to me that our industrial progress has for the past year been backward rather than forward, and no gathering of business men at this time should fail to recognise the seriousness of our present trend, and seek for the cause and cure.

During the war, and more particularly since the Armistice, we have been passing through successive stages of higher wage demands, higher profit demands; less hours, less work; more leisure, more extravagance; less responsibility, less patriotism. The result is higher costs, and a progress toward disaster. Economic truths have been discarded for theories which sound well but won't work. We are confused by a plethora of general terms, undefined in our own minds or in the minds of those who utter them. Living wage, collective bargaining, profiteering, labour as a commodity, partnership of capital and labour, the right to organise, shop representation, combination, a new era, democracy in industry, socialisation of industry, are some of the terms used each day in every publication; in every forum. No one attempts to define what is meant, because every one has his own interpretation, and they nearly all differ. The great mass of American working men just want to work—the great mass of American employers just want to produce. They both recognise that they are inter-dependent and have co-operative interests, and if permitted to carry on, other conditions will correct themselves. But they, too, are confused by what is after all nothing more or less than an insidious socialistic propaganda. Five months of honest productive effort of American industry will supply all of our own needs, and permit of seven months' effort to replenishment of the world. Yet at our present rate of progress, we are unable to supply our own needs.

Until recently, all Europe was pursuing similar tactics. Each nation's industry was striving to emulate the progress of Russia under Lenin, who has put into force all of the theories which we are talking about, as he understands them. But to-day, at least two of the nations who have been passing through this after-war orgy are recovering. Belgium is no longer striving to see how few hours she can work, but rather how many hours bodily strength and health will permit. Germany, under pre-war conditions a wonderful industrial nation, has lost heavily in man power. But before the war 3,500,000 of her men were constantly removed from industry for military purposes, and millions more were engaged in supplying those 3,500,000. To-day there is no such drain on her industrial man power, and the release of this burden more than offsets her losses during the war. They have stopped talking about the eight, seven or six hour day, and are ready to devote ten, eleven and twelve hours a day to restoring her industrial position.

Whether or not we are living in a new world, or a new era, the same sun shines, the same God rules. None of the formulas of chemical reaction have changed. We continue to progress in the discovery of new things, but they do not develop over night. Time and honest effort, not laws or theories, will make the discoveries available for service.

I hope that all men of industry who meet together, whether employer or employee, will consider the seriousness of our industrial future. Increased production is the only method which will make permanently possible improved standards of living or working conditions. Our greatest need is for a re-awakening of the patriotic impulses created during the war. Now, the slogan should be "Industrial Patriotism."

* From an address delivered at the recent Exposition of Chemical Industries, Chicago.

The Oxidation of Ammonia

Paper by Dr. Knox before the Edinburgh Section

THE second meeting of the session of the Edinburgh and East of Scotland Section of the Society of Chemical Industry was held on Tuesday, December 9, in the Cockburn Hotel, Edinburgh, Dr. J. S. Jerdan, chairman of the section, presiding.

Dr. Joseph Knox (Glasgow), in a Paper on "The Oxidation of Ammonia," said that the whole question of the oxidation of ammonia and its products was closely bound up with the more general question of the so-called conversion of the nitrogen of the air into products of economic value—nitric acid, ammonia, cyanides, nitrates and cyanamides.

The Three Processes

The chief methods at present in use for the so-called fixation of ammonia might be classified into three processes. There was the Arc process dependent on the use of high temperature generated by the electric arc. The second was the Cyanamide process, in which calcium carbide was taken and heated in an atmosphere of pure nitrogen to 1,000°C. The resulting product was cyanamide, known in commerce as "nitrolim." The third method was the so-called Haber process, which had been developed practically exclusively in Germany. Under the Haber process ammonia was produced direct from pure nitrogen and pure hydrogen. In the proportion of 3 to 5 they were subjected to catalytic action under certain conditions, and those conditions were technically difficult to realise. At high temperatures the amount of ammonia in the reacting mixture was too small in extent when equilibrium was attained. At low temperature the reaction proceeded too slowly for technical purposes, and in technical practice they were forced to work at a temperature of 500° to 600° in order to make it with anything like reasonable speed. Under these conditions the concentration was extremely small, but it might be increased if they increased the pressure of the gases. The problem first of all was to find a catalytic agent to speed up the reaction at lower temperatures in order to get a higher concentration of ammonia. If they could get a catalyst of this nature, it would obviate the necessity of working under high pressures, always a difficult thing to do in technical practice. Such a catalyst had not been found, and the chemist had to be content with a catalyst which accelerated the speed of reaction at as low a temperature as possible. Many catalysts had been patented, but he gave preference to the iron catalyst containing small quantities of various other metals. With this catalyst the reaction was carried out under a pressure of 150 atmospheres, so that the engineering difficulties in the construction of such a plant were not the least troubles to be overcome. This process was a modified Haber process, under which they got good yields of ammonia at a much lower pressure than that used by Haber.

According to a newspaper report, he said, a technical method of working under a much higher pressure—up to 1,000 atmospheres—was said to have been reached by Claude, the French expert. If it was true that a technical method of working under such a high pressure as 1,000 atmospheres had been found the yield of ammonia would be enormously increased. They would get something like 50 per cent. of the alkaline mixture. Ammonia might be oxidised by atmospheric oxygen. When ammonia burned in air or oxygen the chief products were nitrogen and water. When a mixture of air and ammonia was passed over spongy platinum the chief product of reaction was nitric oxide, which was formed in fairly large amount. The proportion depended mainly on the conditions of temperature and so on, and it seemed to form a primary product of oxidation of ammonia in presence of platinum as a catalyst. Oxidation with spongy platinum was never quantitative, and the nitric oxide was accompanied more or less by nitrogen. The catalytic action of platinum in oxidising ammonia to nitric acid and water had been known for eighty years, but it was only in comparatively recent times that conditions had been worked out thoroughly. Even now they did not know what reaction led to the formation of nitrogen, which always accompanied nitric oxide to a more or less extent.

The most probable source of the nitrogen was the decomposition of the nitric oxide produced. Direct oxidation of the ammonia to nitrogen and water was another probable source of nitrogen which very likely occurred if they did not hit the conditions for nitric oxide. Again, in certain circumstances in the reaction between nitric oxide and ammonia the formation of nitrogen and water also probably took place, although in technical practice that reaction was probably pretty well excluded. The only catalyst which had been used in technical practice, so far as he knew, was platinum, and although much cheaper catalysts had been put forward, platinum maintained its place as *the* catalyst. If they assumed that the reaction was reversible it could be shown that even at a high temperature the reaction between ammonia and oxygen would be practically quantitative. If the reaction presented equilibrium conditions the yield of ammonia was practically independent of the temperature, being practically quantitative at a pretty high temperature.

Using platinum gause as a catalyst it was possible to get 95 per cent. of ammonia in the nitric oxide. It was possible to maintain the platinum at a temperature of 600 or 700 without external sources of heating. The time of contact with the gause of the catalyst was very short—1,000th of a second. It might be considerably greater without appreciably affecting the yield. The composition of the ammonia mixture which was passed over the catalyst had also remarkably little effect on the yield. Theoretically in order to produce nitric oxide a maximum of 13·8 per cent. of ammonia was required. The effect of impurities in the gas mixture varied with the nature of the impurity. Dust and especially parts of metallic oxide or peroxide should be rigidly excluded. The presence of moisture in the gas had not the slightest influence. Hydrogen phosphide had a remarkable effect even in minute particles as the activity of the platinum fell off tremendously. Platinum did not at once give its maximum activity. It was only reached after being used for a considerable time. The platinum surface gradually assumed grey colours and the physical properties were altered as the result of the action. Dr. Knox then gave details of the technical plant for the oxidation of ammonia.

Cost of Different Processes

With regard to the cost of the various synthetic compounds it was extremely difficult to form any idea, the figures given by different authorities varying widely. Taking the most probable figures for power requirements the arc process required about 9·5 H.P. per ton of nitrogen fixed, while the cyanamide process required 3·8 and the Haber process about 1·4. In the case of the Haber process it included the power required for the preparation, purifying and compression of the hydrogen and nitrogen and the refrigeration of the ammonia. The cost of the arc process depended more on the horsepower than the other two, and ran up fairly rapidly with the cost of energy. In the cyanamide process the increase in cost of energy did not make nearly so much difference to the cost of the nitric acid because so much less energy was used. The ammonia made by the Haber process was estimated to cost from £12½ to £15 per ton, according to the price estimated for hydrogen, nitrogen and power. The conversion to nitric acid brought the nitric acid to about £11 per ton, and the power costs estimates were comparatively small—anything to about £3 5s. 7d. per ton. It was not probable that the arc process could be worked very well in this country because it did not seem possible to obtain electric power at anything like one-tenth of a penny per unit as they did on the Continent. The arc process produced the cheapest nitric acid where the cost of energy was below 2d. per B.Th.U. Other disadvantages of the arc process were the very large cost of installation both for power and plant, and the fact that nitric acid was not an easy substance to transport. The ammonia produced by the Haber process could be used almost directly as a fertiliser, and transported quite readily. There was no doubt there was a big future for the synthetic processes. The Government had realised the importance of nitrogen and private enterprise was beginning to realise the importance of the question.

Discussion

Professor Walker (Edinburgh University) expressed some doubt as to Claude's working at 1,000 atmospheres.

Dr. Cumming (Edinburgh University) referred to the experiments on this subject started by the University before the war, and expressed his regret at the necessity for discontinuing them. His firm conviction was that the cyanamide process was the process of the future.

Dr. Lauder said the Paper impressed one with the difficulty of oxidising ammonia and nitric acid by chemical means as compared with the remarkable ease with which this was brought about in the soil.

Mr. Porritt (North British Rubber Co.) inquired as to the cost of hydrogen produced by the Haber process.

Dr. Knox: Its cost in Germany before the war was one-sixth of a penny per lb.

Mr. Kirkcaldy, referring to Dr. Lauder's remark about the ease with which bacteria were able to convert ammonia into nitric acid in the soil, said that that seemed to him a very promising field for further experiment.

The Chairman asked Dr. Knox what measures he took for removing the presence of hydrogen phosphide from the gases.

Dr. Knox, in reply, said he quite agreed with Dr. Jerdan: there was still room for quite a large amount of experiment. The dusty nature of cyanamide had always been an objection, and its manufacture was very prejudicial to the workers, and it got into the atmosphere in transit. The granular form was prepared by mixing the cyanamide with a little oil, which probably accounted for the fact that it decomposed so slowly in the soil. As to the question of the oxidation of ammonia by means of bacteria, quite a good deal had been done in France. The method used there was to pass a diluted solution of the ammonium through bacterised peat, the acid formed being neutralised by lime as it was produced. In this way the concentration of ammonia and nitrite in the solution could be increased by a very fair amount, because it was then found that the nitrite did not affect the bacteria. By adding a little more ammonia salt to the liquid that came through the amount of nitrite in the liquor could be very largely increased. The process recommended for removing phosphide from the gas was by sodium hydroxide solution. He did not know how much nitric acid was made from cyanamide ammonia. The effect of phosphide of hydrogen on the catalyst was worked up and investigated by two American workers. It was quite easy to fix up an automatic analyst.

Centrifugal Extractors and Separators

Paper by Mr. E. A. Alliott

MR. E. A. ALLIOTT, in delivering a lecture on "Centrifugal Extractors and Separators," at the Manchester College of Technology, on Tuesday, December 9, said that centrifugal machines were used for draining off a liquid from solid particles to which it adhered, for filtering off liquor from the solids suspended in it, and for separating mixtures, containing two liquids of different specific gravities. Specialised machines could be used for grading the solid portions in addition to separating them from the liquor with which they were mixed. Such machines were used in a very large variety of trades, among others the laundry trade, dye works, bleach works, sugar refineries, salt works, dairies, colour works, varnish works and clay mines.

The Principle of the Extractor

The principle of the extractor was very simple and easily understood. If a heap of moist crystals were allowed to stand on a draining board, or on a frame covered with canvas, the excess of liquid would gradually run off by its own weight, leaving the solid behind, but with a fair amount of liquid still caught in the spaces between the crystals. In an extractor, centrifugal force was used to replace the action of gravity, and it was possible to exert a force equal to many times the weight of the material, thus causing it to drain very effectively. In ordinary large machines the force exerted upon a drop of water, or other liquid, would be from 400 to 600 times its own weight and the basket rim would have a speed of well over 100 miles per hour. In special separators of very small size, a force could be exerted up to as much as 40,000 times the weight of any particle on the rim of the machine. When the machine was used for removing water the term Hydro-Extractor was often employed. Mr. Alliott then showed an illustration of an underdriven machine, with guide pulleys and overhead gear which was one of the simplest forms of centrifugal machines, and of a type still very largely in use in dye works and chemical works. The next illustration was one, shown in section, of an underdriven machine with discharge doors, and, in giving a full description of the construction, Mr. Alliott drew attention to the basket, which was constructed of steel or copper plate and perforated with holes to permit the escape of liquid.

Baskets

There were two main ways of building a basket. One was by means of steel plate, or plates of other materials, with perforations drilled in to permit the escape of the liquor; or the basket rim might be built up of wire. The wire basket gave better draining but would allow the escape of any materials consisting of fine grains. Moreover, it was not as strong as a basket built up of plates, and the latter was therefore, the more usual form. For dealing with materials which were difficult to drain thoroughly the inside of the plate basket was often fitted with a wire gauze, a coarse gauze being put next to the plate, to allow the liquor to get freely to the holes, while above this a fine mesh was placed to prevent small crystals getting through. In the event of very fine material being dealt with, which would pass through the gauze, or might clog it, a filter cloth was placed over the top gauze. Baskets made of steel plate or wire were generally tinned or galvanised to protect them. They might, however, be constructed in copper or aluminium, or covered with a vulcanite protection which was extremely good for dealing with weak acids, but must be used with caution if the material was at all warm when fed through the machine. Baskets were sometimes covered with homogeneous lead, and occasionally porcelain liners were put in in such a way that the porcelain was supported by the steel of the basket and the liquor was made to drain away without coming into contact with anything but the porcelain.

Power and Speeds

Mr. Alliott explained that the power necessary to start up a centrifugal was very much greater than that needed to run it at full speed. Curves were shown depicting the horse-power required for electrically-driven centrifugals of different sizes.

A section of a special type of centrifugal was also shown, the machine being widely used for extracting oil from waste, and fat and grease from slaughter house offal and waste of all descriptions. The main feature of the machine was that it was driven by a turbine, the blades of which were fastened to the bottom of the basket. Steam was circulated through the material, and the heat and moisture helped to bring the grease away. The material was usually placed in a removable cage which fitted into the basket proper. The theory of the centrifugal machine was then dealt with.

A series of curves indicating the speeds at which machines of various sizes required to be run to give the same rim speed and the same extractive power as a 36 in. basket at 1,000 revs. per min. were then shown. For smaller machines the rim speed curve lay at an increasing distance above the other, indicating that increasingly high extraction could be obtained, while for large machines the converse held good. Commercial rim speeds and extractive powers based on the same standard were shown to have irregularities due to the difference between book theory and practice. Although the rim speeds were higher for the larger machines this was not sufficient to prevent a considerable falling off in effectiveness. Big machines were suitable for rough draining large outputs but small ones gave the best drying result. In explaining the construction of suspended under-driven hydros, Mr. Alliott stated that even with large commercial machines 5 lb. load out of balance, if concentrated on one spot on the rim of a machine might be equivalent to a pull of over a ton travelling round at many hundred revolutions a minute. Where it was difficult to put in a proper foundation, or desired to place a machine on an upper floor, bad loading or an awkward material might cause vibrations sufficient to damage the building and supports. A simple device for preventing this result consisted of hanging the whole machine on four rods carried by pillars, each rod having a hemispherical bearing top and bottom. By this method the whole machine was lifted out of contact with the floor and was free to swing slightly. An elevated suspended machine fitted with a bottom discharge was extremely useful for dealing with such crystals as nitrate of ammonia, sulphate of ammonia, Epsom salts, &c. Examples of a steam-driven pendulum machine, an electrically-driven suspended machine, and laundry peg-top centrifugal machines were shown and explained in detail. In dealing with a type of self-balancing hydro Mr. Alliott stated that it was of interest to note that for sulphate of ammonia, baskets of perforated steel plate had proved to be quite satisfactory, without any gauzes or linings. The life of such a basket in continual use would be from nine to 12 months, and it was generally considered cheaper to replace it than to provide copper ones with elaborate linings. Probably the favourite arrangement for this purpose was to install a machine having a steam engine, with horizontal flywheel mounted on the baseplate, driving through a belt. This permitted the basket to be run at a lower speed when loading. A view of an actual installation at the works of Messrs. The Hoffman Manufacturing Co., Ltd., Chelmsford, was then thrown on the screen, which dealt with about 9 tons of steel swarf a day, recovering 500 to 1,000 gallons of oil. Another type in common use in chemical works was the Weston Motor-Driven Machine, and a battery of Weston Centrifugals driven by water motor of the Pelton Wheel type was described. A steam-driven pump of duplex pattern was usually employed to supply water under pressure to the motors. This arrangement permitted of a convenient adjustment of speed to suit the grade of material under treatment, and also obviated the need of any driving shaft.

Shafting, if given a jar, would vibrate much in the same manner as a violin string. It was also resonant, and would respond to a suitable disturbance just as a violin string would answer if the proper note was struck loudly near by. If the speed at which the shaft ran bore a certain relation to the natural speed of vibration, the shaft would rattle and shake, bend itself into a bow, and, if the speed were kept constant, would finally break, unless there was sufficient friction to keep the deflection within bounds.

Swinging Spindle Centrifugals

In dealing with a swinging spindle centrifugal it was necessary to consider that the basket inclined as the shaft deflected, and gyroscopic forces might this be brought into play which tended to prevent the buffers pulling it back into its proper axis. Mr. Alliott then exhaustively explained the principle of precession, and illustrated his point by means of a gyroscope consisting of a small flywheel supported in gimbals, so that it was free to tilt in a vertical plane, or to twist in a horizontal one, in addition to spinning about its axis, and at the same time holding a small weight suspended.. Mr. Alliott then gave details as to the load capacities of various types of machines used in connection with different industries, the amount of moisture remaining after whizzing and the speeds of hydros. In draining materials of an open structure, free from internal moisture, increased speed did not produce a proportionate effect, and only gave rise to greater wear and tear. The fixed spindle type was of advantage in large machines dealing with liquid loads as no "surging" was set up. The suspended machine hung on rods was less sensitive to gyration than the free spindle type, and the out-of-balance vibrations were equally well isolated. If the free spindle type were badly loaded it might refuse to gain speed, and the attendant would have to pull it up and reload it. Illustrations were then given of the continuous operating centrifugal, of which the Schaefer Ter Meer and the Elmore machines were described. The "Link Belt" machine used for drying coal was also explained, and Mr. Alliott then passed on to the consideration of Subsiders and Separators, of which both classes of machine were distinguished by using a solid or imperforate basket. The term "Subsider" referred to a machine abstracting solid particles from liquid, while a machine which was separating two liquids was called a "Separator." As a matter of fact, those functions were often combined. Spratt's Subsider, a special type evolved during the war, for cleaning oil from metallic particles, the Gee Separator, a recent development for large scale work and the Princess Cream Separator for dairy purposes, were very fully explained. The latter machine was stated to be capable of dealing with wool scourings, &c.

Sharples Centrifugal

Finally the Sharples Centrifugal was dealt with, its peculiar feature being that the bowl was only a few inches diameter, while the length was very considerable and the speeds extremely high. This type was very successful for the purpose of clarifying varnish, and was also used for the recovery of wool fat, clarification of serums, &c. It was also said to be capable of filtering bacteria from water in some degree. In concluding a very long and extremely interesting paper, Mr. Alliott stated it had only been possible to give broad outlines of underlying principles. The application of centrifugal force presented a huge field of possibility, and its best application to any problem required deep study and long experience.

Oil and Colour Chemists

Paper by Mr. A. M. Gibbons

AT a meeting of the Oil and Colour Chemists' Association, on Thursday, December 11, Mr. A. M. Gibbon read a Paper on "The Principle of Application of Paints and Varnishes and how it Affects the Works Chemist." The object of the Paper, he said, was to point out the importance of the paint and varnish works chemist studying the manner and conditions under which the paints and varnishes which he prepared were applied in practice.

Coach-painting was one of the few branches of painting in which the users were highly skilled workmen, and the works chemist need hardly bother to do more than see that the materials were up to standard. Vast improvements could be made in ships paints. It was essential that ships paint manufacturers and their chemists should consult with shipbuilders and ascertain how the materials were applied. They should then set to work to improve the materials which they supplied and also point out to the shipowners and others concerned better methods of applying them. It was not inconceivable that ships paint manufacturers would be able, by these means, to supply a paint which would give 25 per cent. greater efficiency. With regard to the requirements of aeroplanes, the works chemist had to go into this matter thoroughly because it was a new and highly important branch of the trade and there was no doubt that very good results had been achieved. However, there was room for considerable improvement, and the works chemists would never be able to bring about the improvements which were possible without making a study of the practical conditions of the application and use of the paints and varnishes used for aeroplane work. The same remarks applied to railway paints, which were allied to coach painting. In this case attention had to be paid to the effect of fumes from locomotives, the effect of changes of atmosphere and of jolting.

Paint for food factories was a comparatively young branch of the trade and offered considerable scope for improvement; and here probably, more than in most other cases, was it necessary to study the conditions of use. Then paints for chemical works was a most distressing subject for any works chemist. Often because one paint had been found to be fairly acid-resisting, under certain conditions, it was used in all parts of the works and yet it was known that there was not a paint manufactured to-day which would perfectly resist, say, the blowing off of sulphuric acid fumes. Here, also, was a field for research and improvement.

Dealing with house decorators paints, the author said that he hoped the day would come when large decorators would employ their own chemists to supervise the work of painting. When that happened some of the troubles from which the manufacturer now suffered would disappear. He was also of the opinion that it was necessary for the works chemist to study art as a part of his profession. The manufacture of paints for toy making, and small miscellaneous articles, demanded a totally different set of conditions, because the work was done by spraying or dipping, and it was necessary that the paint should be non-poisonous, and very quick drying to enable the articles to be handled almost as soon as they were finished. There was a big field for improvement here both in paints and spraying apparatus. Another direction in which the works chemist had to look was in connection with the requirements of the scenic artists who wanted something different from industrial paints for painting drop scenes. Similarly, the lithographic artist demanded special materials, water colour paints giving clean bright washes and flat solids which would also remain moist when not in use. Most lithographic artists added gum to produce flat solids, but they would like to have a paint which would give them all they wanted at the first attempt. Another special branch was the requirements of the ordinary artist.

Methods of Applying Paint

The trouble in all these cases was bad application and the chemist would have to set to work to counteract this. If they took stoving enamels, it was not only the materials but the manner in which they were worked in the stove which gave the durability. A good enamel or paint put on by a bad workman often gave worse results than a poor enamel put on by a good workman. A point often overlooked was that it was the pressure of application which determined the degree of durability. The oil and colour chemist must study the conditions of the trade with which he was concerned and not be carried away with the results of scientific experiment only. What was really necessary was that the paint and varnish trade should be sub-divided in such a manner that a particular chemist in a works should specialise on a particular trade and another chemist in the same works should specialise on another trade. This was done to a certain extent already but not sufficiently. In applying paint, nothing had been found to supersede the brush in the hands of a good workman, but it was being displaced for reasons of speed and economy.

All pigments and oils should be tested for durability by a process based on the method of application. If data of this nature were accumulated, the paint chemist would then be armed with knowledge which would help him to meet the various demands. He felt it was necessary to get their minds out of the rut which they seemed too often to get into, and to branch out into something entirely new. For instance, might it not be possible that protective coatings would be supplied in thin sheets to be applied under pressure?

Discussion

Mr. E. BRAND, in the course of the discussion, recalled a specification for iron some years ago which had to go to South America, and one of the conditions was that the metal was to be heated and dipped in linseed oil. The theory put forward was that the linseed oil dried on the surface and prevented the iron from rusting. If lubricating oil were used the same effect was not produced because this oil did not dry in the same way that linseed oil did. The great demand for anti-fouling paints was because they did protect iron from rust. A Government specification for a light yellow or chrome for funnels called for stone colour oxide of zinc which came out of the furnace almost in the form of a refuse. It was put on in the form of a water paint and looked very well. Lithopone was being used for toy paints instead of zincs and leads, these being more readily applied and more suitable for the job.

Mr. A. MOLTENI said that the conditions under which paints were applied were so numerous and varying that it was almost impossible for the chemist to carry out research on lines which would apply to practical conditions generally. Take, for instance, a paint for the protection of iron or steel. The conditions of rusting were so many and so complex that it would be practically useless producing a great number of paints to meet with particular conditions. Personally, he did not think it was necessary to go into a submarine or to examine the bottom of a ship in order to find out the best paint for the particular purpose. It was rather difficult for a chemist to be an expert in every branch, and therefore it seemed to him that the Paper was an appeal for works to have more chemists who would specialise in certain directions.

Mr. R. P. L. BRITTEN said that with regard to pressure being necessary in the application of paints, he thought there was a big field before the chemists to find a paint which did not require pressure. Spraying had done something in this direction, and if proper paint was sprayed on it lasted very well indeed. He would like to know the difference in a paint dried by ordinary exposure and one dried by stoving. His experience was that whereas an air-dried paint was brittle a stove-dried paint was very flexible.

Mr. H. R. WOOD thought works chemists had too much to do in the works to worry about methods of application of paint. The greatest difficulty in ship painting was to get the time for the paint to dry. He would like to know if any machine had been used for ship painting, because the cost of labour was enormous.

Mr. G. W. DUNSTER asked for some information with regard to stoving. He thought that physical testing of paints and enamels was an important matter.

Mr. MAKINS, who said he was interested in the use of paints for train purposes, urged the need for greater attention to the provision of mechanical means for applying paints having regard to the high cost of labour, something like 2s. per hour. If paint chemists in this country did not see to it that their paints were of the right consistency for application by mechanical means they would certainly be left behind.

The CHAIRMAN (Mr. H. Morgan), in closing the discussion, thought a good deal of misconception arose as to what a chemist was and what he ought to do. A good many people looked upon chemists as analysts, whereas 99½ per cent. of their work had nothing to do with analysis. What the large decorators wanted on their staffs was a scientifically trained man who should be more a physicist than a chemist, a man who could look at a problem and see the various conditions which were going to affect that problem. A man who was not scientifically trained very often could not separate the conditions in his own mind, but when a list of the conditions could be foreseen and prepared it was possible to find some means of dealing with them.

The AUTHOR, who reserved his reply to the discussion for the transactions, said he did not mean to suggest that the chemist should be continually wandering round places where the paint which he manufactured was used. There were such things as the travellers' reports and other means of finding out what was happening in practice.

The Action of Water on Lead

Paper by Mr. J. F. Liverseege and Mr. A. W. Knapp

MR. L. P. WILSON presided at a meeting of the Birmingham and Midland Section of the Society of Chemical Industry on December 11, at the University of Birmingham, when the action of water on lead was discussed in a Paper by Mr. J. F. Liverseege, F.I.C. (Birmingham City Analyst), and Mr. A. W. Knapp, B.Sc. Professor Morgan, of the Chemical Department of the University of Birmingham, who has succeeded Professor P. Frankland, was warmly welcomed as a member of the Section.

It was well known, the authors pointed out, that many waters acted on lead. The action was made the subject of extended experiments by Dr. Houston, who invented the erosion test. The waters which Dr. Houston examined were acid in character, and notable for their power of dissolving lead. On the other hand, the authors' experiments dealt with a fairly alkaline natural water which, like distilled water or pure rain water, dissolved very little lead, but which had in the untreated condition, the power of eroding the lead, so that scales, formed on it, fell away, leaving a fresh bright surface open to attack. The erosive ability was not considered by Dr. Houston to be a dangerous quality, save under special conditions and with the presence of bright lead. The water used in the tests was from the Birmingham watershed at Rhyader, in Wales; in order to avoid any risk of so soft a water acting on lead a small proportion of chalk was added to the water at the beginning of the aqueduct; the usual addition in recent years has been about two parts per 100,000. The alkalinity was determined as follows: To 500 cubic cm. of water in a porcelain basin, phenol-phthalein was added, and if a red colour was produced the liquid was titrated cold with deci-normal hydrochloric acid. Lacmoid was then added, and the titration completed whilst boiling. The Welsh water (Rhyader) had a slight alkalinity due to bicarbonates, &c., equal to about 0·3 parts $CaCo_3$ per 100,000. The action on lead was mainly erosive. The erosion test was an estimation of the action of the water on completely immersed sheet lead. The value of the test lay in the fact that a high erosion figure was an advance warning that the water in its fluctuations might be approaching a dangerous condition.

The Erosion Test

The erosion test was performed with bright lead in water with free access to air and under these conditions a water would erode lead when it was unable to act on lead service pipes to any extent. The kind and position of the erosion would depend on a number of conditions, the chief of which was alkalinity. Three kinds of action occurred with waters of alkalinity 0·2 to 0·6 (*i.e.*, untreated Welsh waters), and generally with treated waters, whose alkalinity did not exceed 1·5, the whole of the surface of the lead was eroded. A flocculent precipitate formed which fell to the bottom of the tube, and left the lead surface quite bright but mottled. With treated waters of alkalinity 1·5 to 2·5, the action was usually corrosion rather than erosion; a loosely held opaque white crust formed here and there irregularly on the lead surface. With waters of alkalinity 2·5 and over, the lead almost invariably became covered with a dull whitish film, which appeared to act as a protective coating. (The expression "the alkalinity was 2·8" meant that the total alkalinity, expressed as parts CaCo, per 100,000 of water was 2·8.) In performing the erosion test, commercial sheet lead was used in strips ½ in. wide, and about ⅛ in. thick (1 sq. ft. weighed 4·3 lb.) was scraped bright with a plumber's shave hook, and cut into lengths of 1 in. Each piece was rubbed with a clean duster; 10 cubic cm. of the water was poured from a cylinder into the test tube, and the strip of lead polished with a cloth and dropped into it, the lead being totally immersed. The tube was shaken to remove air bubbles; it was then allowed to stand for 1, 3, 7 or 14 days. If there were no evidence of erosion, the water was decanted into a 50 cubic cm. Nessler cylinder, and the lead strip shaken with about 10 cubic cm. of distilled water, which was poured into the cylinder. The lead was then removed, and the tube washed with 5 cubic cm. of dilute acetic acid (roughly decinormal) and with water until there was 50 cubic cm. in the cylinder. If erosion was doubtful, the water was decanted into a 50 cubic cm. Nessler cylinder, the lead dropped into a funnel, and any eroded lead washed off with a jet of water into the cylinder, dilute acetic acid being used as before. If there was evident erosion, the turbid water was decanted into a 100 cubic cm. flask. The lead was shaken out into a funnel, and allowed to stand a short time before it was emptied into the flask. The tube was washed with more distilled water, and the flask filled up to the mark. When the solution was quite clear 50 cubic cm. or a smaller measured quantity was put into a Nessler cylinder and made up to 50 cubic cm. Comparison was made in 50 cubic cm. cylinders; 5 cubic cm. of the dilute acetic acid and 3 cubic cm. of saturated sulphuretted hydrogen were added to every cylinder. The colour produced by the colloidal lead sulphide was matched by standards put on at the same time. The standards were made with distilled water, except in the case of very dark waters, when it was advisable to include 10 cubic cm. of the original water. The standard lead solution used was of such a strength that 1 cubic cm. =0·0001 gram Pb., and was prepared from a solution 100 times its strength, which contained 1·831 grams lead acetate and 10 cubic cm. normal acetic acid per 100 cubic cm. Standards might be increased by 0·1 or 0·2 cubic cm. of the lead solution after the sulphuretted hydrogen had been added, but these standards were not so reliable as those to which the sulphuretted hydrogen was added last.

Cause of Erosion

"Erosion" was due to the action of oxygen in the presence of water; such variations as secured naturally in the percentage of oxygen present in the water, produced no appreciable effect on the erosion. One day was the most suitable for the erosion test. Exposure to glass lowered the water's erosive ability. In some experiments on the influence of contact with glass of test tube, ordinary tubes were compared with those which had been coated internally with a thin layer of paraffin wax. The mean alkalinity of the water was 2·3. The results showed that the paraffin-coated tubes gave no better duplicate than ordinary tubes, and that the erosion figures in paraffin-coated tubes were higher (mean of 13 tests, paraffin-coated, 4·7; ordinary, 3·8). The greater the depth at which the lead was immersed in the water, the slower the erosive action. The velocity of erosion fell as time proceeded; variation in the volume of water did not appreciably affect erosion. For the untreated water the amount of lead-eroded varied directly with the area of lead exposed. Small changes in the area of the water surface produced no appreciable effect on the erosion. Erosion readily occurred in waters which contained no carbon dioxide. Such variations as occurred naturally in the percentage of carbon dioxide present in the water produced no appreciable effect on the erosion. The presence of from 1 to 2 per cent. of carbon dioxide caused a sudden change from "erosion" to "plumbo-solvency." Carbon dioxide dissolved lead more rapidly in the presence of oxygen. The question might be asked if the presence of carbon dioxide were necessary for erosion to occur. All the evidence we had went to show that it was not necessary. Erosion took place readily in the absence of free carbon dioxide; for example, when 1 to 200 parts of calcium hydrate per 100,000 were present; and, further, erosion took place less rapidly in the presence of bicarbonate and carbon dioxide than with carbonate and hydrate alone. Under normal conditions for ordinary waters, carbon dioxide was an unimportant factor. Given oxygen the alkalinity of the water was the principal factor determining the amount of "erosion." Not only the amount, but the kind of erosion depended chiefly on the alkalinity of the water. The addition of small quantities of calcium hydrate, carbonate and bicarbonate, or of potassium permanganate, decreased erosion. Experiments showed that as the amount of calcium hydrate present in the water increased, the amount of lead eroded fell to a minimum when there was present about 7 to 10 parts of calcium hydrate per 100,000. After this point, increase in the calcium hydrate caused increase in the erosion, which gradually attained about its original amount. As the amount of calcium carbonate and bicarbonate present in the water increased, the amount of lead eroded continually fell. Calcium carbonate was, by far, the most effective preventer of erosion. Only about half the quantity of bicarbonate was required to form a protective coating as compared with carbonate. This would receive a theoretical explanation if, as seemed probable, the coating was a carbonate of lead. As little as 2 parts per 100,000 of calcium carbonate was generally sufficient to form a plumbo-protective coating on the lead. Erosion occurred in the absence of bacteria. The bacteria in the water were not all destroyed by exposure to lead for six hours.

Discussion

The Chairman suggested that, as the tests had been made with ordinary commercial lead, comparative experiments should be made with chemically pure lead, as the latter almost entirely resisted dilute or strong sulphuric acid.

Mr. H. Silvester said the Birmingham water often came under suspicion because of its softness, but as he had frequently to test the action of water on lead he found the Birmingham water an admirable standard to use in waters which were expected to dissolve lead.

Dr. Maxted inquired as to the influence of agitation on the rate of the solution of lead. He thought that agitation might loosen any protective deposit that might be formed.

Mr. Knapp, in reply, said commercial lead was used because it was felt they were dealing with a practical problem. Commercial lead was extremely pure, but he was willing to test with chemically pure lead. Neither the question of varying temperature nor that of agitation had been dealt with. They had tried the effect of adding small quantities of pot-permanganate, and found it reduced erosive ability to a low figure.

There was no risk of solvent action with the Birmingham water, Mr. Liverseege observed. He did not think there was a better supply in the country; the water was neutral or slightly alkali, and there was no trouble from peat.

THE APPEAL TRIBUNAL for the County of London under the Profiteering Act has now been fully constituted. The Tribunal will hear appeals from the decision of the Local Profiteering Committees of the Metropolitan Boroughs comprised within the Administrative County of London.

Science and Industry

National Conference on Research Problems

A CONFERENCE of representatives of research organisations connected with the Department of Scientific and Industrial Research was held at the Institution of Civil Engineers, Great George Street, Westminster, on Friday, when Papers were read by Major H. J. W. Bliss (Director of Research of the British Research Association for the Woollen and Worsted Industries), on "Research Associations and Consulting Work," and the "Collection and Indexing of Information," and by Dr. W. Lawrence Ball (of the Fine Cotton Spinners' and Doublers' Association) on "The Equipment of Research Laboratories." Mr. A. J. Balfour, M.P. (Lord Chairman of the Privy Council of the Department) was in the chair; and on the platform with him were Sir George T. Beilby, Sir Maurice Fitzmaurice and the Hon. Sir Charles A. Parsons, members of the Advisory Council for Scientific and Industrial Research.

Mr. Balfour, in the course of his opening address, said that evidently the industrial progress of mankind was going to be in the future more and more dependent upon the alliance of science and industry, and on the co-operation of different branches of science with each other. The Germans marshalled all the forces of science to help them develop their great industrial effort. We must not imitate them, but must follow their example. They saw how absolutely necessary it was, not merely in the competition of people with people, of industry with industry, of one community with another, but from a broader point of view, the point of view which really depended upon the consideration that it is only upon our increasing knowledge of the powers of Nature that we can expect to improve the lot of man. He did not suggest that mere material progress was all progress, or that either prosperity in trade or the cheapening of manufactures was going to be the great regenerator of mankind. He accepted the view that man did not live by bread alone. But if they wished to improve the material lot of man it would not be by quarrelling over the manner in which profits were to be distributed, or any of the controversies which divided various interests—these were subjects we could not avoid—but by the command which, for industrial purposes, man had over the forces of Nature. That could only be attained in the first place by the cultivation of pure science, science for itself, of knowledge for its own sake. That end having been obtained, it remained to apply that knowledge to the great purposes of industrial development.

Dealing with the subject of "Equipment of Research Laboratories," Dr. W. Lawrence Ball, M.A., said the worker in control of a research laboratory was very much the slave of circumstance. The new field of knowledge might be impossible until suitable equipment had been devised, or, if not impossible, progress through it might be so slow and difficult that it was quicker to wait for such equipment to arrive. Or sometimes the most efficient plan might be to go back, trying for another and easier path which ultimately threw off a practicable track to the far side of the difficult area. The practical problem was to decide on the form which the equipment for research laboratories should take. Throughout his connection with the British Cotton Industry Research Association he had advocated the completest possible elasticity of design in the provision for experimental work, whether as affecting the finances, annual budget, site, buildings, apparatus, machinery or staff. This plea for elasticity was relevant even in pure science. When we turned to industrial research we found that the technique of every branch of science was called in to assist the student, and only the future could decide whether the predominant section of the British Cotton Industry Research Association would be that of the mechanical engineer, or the molecular physicist, the chemists, electricians, botanists, or mathematicians. They must be as free as was practicable to grow in one direction or shrink in another, to generalise or to specialise, as circumstances and future discoveries might demand, and the best equipment for them would be that which could be rearranged, extended or scrapped entirely with the least trouble, expense, or compunction, provided always that it was equal to its task of obtaining accurate knowledge about, and for the use of, the cotton industry.

Major H. J. W. BLISS, F.I.C., gave a brief account of the causes that were leading to certain developments of the work of the British Research Association for the Woollen and Worsted Industries, and of the steps that were being taken with regard to them. As regarded the textile trades generally, Major Bliss said the mass of work to be done was appalling, and overlapping of investigations and overlooking of old work was inevitable for a long time to come; but this would diminish as time went on. With regard to the pure sciences, the abstracts and indices which related to his industry were available but those things had not been prepared from their point of view, so that many matters that might be of interest to the textile trades might escape notice or prominence. In dyeing only, thanks to the work of the Society of Dyers and Colourists, were matters better, and it should be added that the Textile Institute was making an effort to meet the need for the future in the systematic abstraction of relevant literature and patents outside dyeing.

Analysis of Aluminium and Alloys

Paper by Mr. J. Myers

AT the Newcastle-on-Tyne Chemical Industry Club on Tuesday, December 9, Mr. J. Myers read a Paper on "Notes on the Analysis of Aluminium and Its Alloys." Mr. O. Smalley, president of the Technical Section, presided.

Scrap Alloys and High Tenacity Light Alloys

The most common alloys, Mr. Myers said, of aluminium contained one or more of the following metals: Copper, zinc, iron, manganese, magnesium, nickel and silicon, and the best methods of estimating them were to avoid as far as possible the separation of A by precipitation owing to the bulky nature of the precipitate and the difficulty of obtaining it free from impurities. It was generally an advantage to adopt a method that did not involve a lengthy qualitative examination before proceeding to the quantitative examination.

The lecturer outlined a method of dealing with scrap A alloys of varied compositions and high tenacity light alloys. For the manganese 1·1 gr. was dissolved in dilute sulphuric nitric acid added, oxidised with sodium bismuthate and cooled. It was cleared with $F.SO_4$ solution, oxidised with excess of bismuthate filtrated through asbestos and titrated with ferrous ammonium sulphate and N/10 $KMNO_4$. For the main analysis two gr. of the sample was weighed into a 500 beaker and covered with 20° of water. A mixture of 20° HCl + 10 nitric acid was added carefully as the action was rather violent and when solution was completed 15 of sulphuric acid was added. The solution was allowed to evaporate gently until copious fumes of SO_3 were evolved, when the beaker was removed from the plate and allowed to cool. Sixty degrees of water were added, the sulphates brought into solution by gently boiling and filtering into a 200 beaker. The precipitate contained all the silica silicon and lead sulphate and after washing with hot water was burnt off gently and weighed. The silica was volatilised with HF and sulphuric acid and calculated to silicon. The residue should be taken dry with HF, HNO_3 and sulphuric acid to volatilise the silicon. When much lead was present it was advisable to separate it by dissolving out with hot ammonium acetate. A turbidity in the filtrate caused by the dilution of the acid with the hot wash water pointed to the presence of tin. In that case the filtrate was diluted to 500° with hot water boiled for half an hour and allowed to settle. When no turbidity was apparent in the filtrate from the silicon estimation, the liquid was cooled, 5° of HNO_3 added and the copper deposited electrically, using a revolving anode and a current of 6 amperes. The electrolysis was continued for three minutes after the solution was colourless, the electrodes quickly washed with sulphuric acid water, the cathode dipped in alcohol, dried and weighed. The solution should still be examined for tin by passing through SH_2 and 10 gr. of tartaric acid and five gr. of ammonium chloride added. A solution of dimethylglyorine was added and the solution made just ammonical and allowed to stand at about 90°C. for 15 minutes. Any nickel present was filtered off and weighed. The solution from the nickel estimation was heated to about 80°C. and SH_2 passed through for ten minutes and the precipitate allowed to stand and settle in a warm place. The precipitate containing all the zinc and iron and part of the manganese was filtered off, washed with SH_2 water until free from tartaric acid and dissolved in HCl and bromine. The bromine was boiled off and the iron precipitated with ammonium hydrate and ammonium acetate. This was washed, dissolved in hydrocloric acid, reduced with stannous chloride, mercuric chloride added and titrated with potassium bichromate. The manganese was precipitated with bromine and the zinc solution made just acid. This was raised to boiling and the zinc precipitated as zinc ammonium phosphate with a solution of 5 gr. of ammonia phosphate. The filtrate from the unified sulphides was made acid with acetic, the SH_2 boiled off and any sulphur filtered off. The liquid was cooled, made slightly ammonical, sodium phosphate solution added and stirred vigorously. One-third bulk of ammonia was added, stirring continued for ten minutes and then allowed to stand overnight. The magnesium was filtered, washed with ammonia water and redissolved in HCl, and re-precipitated, using one gr. of tartaric acid. The precipitate was burnt off to magnesium pyrophosphate, and if manganese were present it was invariably accompanied by some manganese pyrophosphate which was estimated by dissolving in dilute nitric acid, oxidising with bismuthate and titrating with $KNMO_4$.

An interesting discussion followed, in which Mr. Dunford Smith, Mr. Crowther, Mr. Scraggs and the Chairman took part.

THE MINISTRY OF MUNITIONS announce that the following stocks (exclusive of old metal and scrap) in this country were in their possession on December 1, 1919: Copper, 14,867 tons; spelter (G.O.B.), 12,848 tons; spelter (refined), 10,940 tons; aluminium, 8,911 tons; soft pig lead, 59,912 tons; nickel, 1,800 tons; antimony regulus, 2,950 tons. A proportion of the above stocks is already sold to the trade for foward delivery.

The Society of Chemical Industry

Papers Before the Nottingham Section

AT a meeting of the Nottingham Section of the Society of Chemical Industry, held in the Physics Lecture Theatre on Tuesday, December 9, two Papers were read,

Effect of Heating Linseed Oil Under Pressure and Its Bearing on "Litho Oils"

In this Paper Mr. S. Coffey, B.Sc., gave the results of an investigation into the effect of heating linseed oil to a temperature of 250°C. in tubes sealed up with a very small air space, and therefore under pressure and practically in absence of air. Previous investigators quoted had heated the oil at atmospheric pressure. They had noticed a considerable increase in density, viscosity, free acid values and mean molecular weight, a decrease in the amount of hexabromides (bromine addition products insoluble in ether) and a fall in the iodine absorption determined by Wigs' method. The saponification value remained constant. Evidently then the oil had polymerised free and had been formed from the glycerides and the amount of unsaturated compounds had increased. Under the conditions of the author's experiments, mentioned above, the oil became lighter in colour instead of darker as when heated in open tubes and developed a slightly pungent, instead of the usual acrid, odour.

The densities, viscosities, free acid values, solubilities in ether light petroleum and acetone, iodine absorptions and hexabromide values were estimated on the samples which had been heated for varying times up to 42 hours. The results showed a general agreement with those of the previous investigators. Some were plotted on time, property, curves. The densities and viscosities increased continuously with time of heating, although not uniformly, there being a remarkable inflection on the curves after about 21 hours' heating. The free acid values showed an inflection at about the same time, but reached a limit after about 30 hours. The iodine absorptions decreased uniformly and continuously throughout. The hexabromide value which at first was 43 per cent. of the oil, decreased to zero after about seven hours' heating.

From these results the following conclusions were drawn: The increase in free and value to 2·4 times the original was probably due to hydrolysis by the small amount of water present as an impurity. It might be calculated that less than 1 per cent. would suffice for the observed effect. It was noteworthy that previous workers in open vessels obtained increases in free acid up to 40 times the initial value, with no sign of a limit having been reached. The disappearance of the ether insoluble hexabromide showed a destruction of the lindenic glycerides which very probably occurred through their polymerisation to glycerides of di-lindenic acid

$$COOH . C_{17} H_{29} . C_{17} . H_{29} . COOH$$

This would lead to a decrease in the unsaturation as shown by the decrease in the iodine absorption.

Some Practical Applications of the Electron Theory

Dr. E. P. Hedley, in an interesting account of the evolution of the X ray tube, and of the growth of our knowledge of electrons and X rays, illustrated by experiments and exhibits, first called attention to the changes in luminosity and electrical resistance which took place in vacuum tubes from which the air was progressively exhausted. The dark space which appeared at high vacua was rendered conducting by the electrons, moving at high speed, but invisible until they struck a solid obstruction which they might cause to fluoresce or rise to a high temperature, or they might display their energy by causing rotation of the well-known Crooke's mill. The fact that they travelled in straight lines was shown by the sharp shadow of a cross placed in their path, and their negative charge by the curvature of this shadow when a powerful magnetic field was generated. The fundamental experiments were then described, by which J. J. Thomson determined the ratio e/m of the electron, and its velocity of 10,000 miles per second and subsequently its mass 10^{-27} grams and its charge 1×10^{-20} electromagnetic units, the same as that on a hydrogen ion in solution. The existence of electrons having thus been briefly demonstrated, the way in which electronic conduction had been utilised in technology was considered.

Scottish Chemists and An i-dumping Bill

AT the annual general meeting of the Edinburgh and East of Scotland Section of the Institute of Chemistry of Great Britain and Ireland, held in the Cockburn Hotel, Edinburgh—Dr. T. W. Drinkwater in the chair—the following office bearers were elected: Chairman, Dr. T. W. Drinkwater; vice-chairman, Dr. Leonard Dobbin; hon. secretary, Mr. B. D. W. Luff. A discussion took place regarding the supply of chemicals and scientific apparatus with special reference to the position created by the introduction of the Anti-Dumping Bill, and the following resolution was carried unanimously: "That this meeting is strongly of the opinion that the Council of the Institute of Chemistry should bring to the notice of the Government Department concerned the great importance of ensuring that before any regulations or orders concerning laboratory chemicals and scientific apparatus be made under the proposed Anti-Dumping Bill, the advice of the Council of the Institute or of persons nominated by them be sought."

Seizure of Pyrogallic Acid

Judgment Against the Crown

ON Wednesday, in the Commercial Court of the King's Bench Division, Mr. Justice Sankey gave judgment in the case of the Attorney General v. John Brown.

His lordship, in giving judgment, said in this case the Attorney General on behalf of the Crown asked for the condemnation and forfeiture of 6 cases of pyrogallic acid belonging to the defendant. By a proclamation known as the Prohibition of Imports Proclamation, 1919, dated June 25 last, the Crown, purporting to act under Section 43 of the Customs Consolidation Act, 1876, prohibited the importation into the United Kingdom of chemicals of all descriptions unless under licence. Section 43 provided:—The importation of arms, ammunition, gun powder, or any other goods may be prohibited by proclamation or Order in Council. On August 29, 1919, a Customs officer seized the six cases which had been imported into Manchester without any licence being given. The defendant wrote pointing out that the acid was ordered by him from a Chemical Company in Canada on June 17, 1919, before the regulations were enacted, and asking that entry should be given to the goods. He added that it was for the chemical company's convenience the goods were shipped from New York instead of from Canada. The Customs officers replied that the consigner's were a chemical company of New York and that the goods were consigned in the U.S.A., but that if defendant could produce documentary evidence that the goods were of Canadian origin the goods would be released. The defendant replied that he was unable to give any such evidence as was asked for, and, it might be assumed that the goods were of American origin and therefore not within the general licence that existed to import goods from British Dominions. Proceedings were begun by the Attorney General asking for forfeiture of the goods and the defendant then took up the position that the Proclamation under which the Customs officers purported to act was of no legal force and effect. The argument for the Crown was that the words in Section 43 meant what they said, and that H. M. was entitled to prohibit the import of goods of any sort or description into this country. On behalf of the defendant it was contended that the general words should be construed to mean goods of the same sort or kind as guns, ammunition, gun powder. Further, that there was no right to make exceptions, the Crown could prohibit goods altogether, but could not prohibit goods from one country while allowing the importation from another. The Attorney General did not shrink from the consequences of his argument and admitted that if he were correct it was equally open to the executive of their own motion to prohibit the importation of corn and meat into this country from certain countries while allowing corn and meat to come in from other countries.

The case turned on the construction of Section 43, and the point was whether the argument that the executive had absolute power to prevent imports was correct or whether the narrower construction contended for by the defendant was a correct one. He was of opinion that the general words must be restricted to the meaning of the particular words and that the words "any other goods" meant goods of the class of arms, ammunition, and gun powder. The Attorney General further contended that he was entitled to succeed on the ground that pyrogallic acid was of the same class of goods as arms, ammunition, and gun powder. He was instructed to argue that as pyrogallic acid could be used in photography and as photography was used in war, therefore it was of the same class of goods. In his view it would be straining language to give effect to that contention. It was hard to conceive any article that was not used in modern warfare. It might just as well be contended that bread and meat should be included because they were used to feed troops in the field. In so far as it was a question of fact he found that pyrogallic acid was not of the same class as the articles set out in the section. Finally, it must be remembered that Section 43 was a penal section and must be construed strictly. In his view it would not be proper to hold that Parliament intended to impose the penalty demanded in this case by words which were uncertain and unequivocal. He had, therefore, come to the conclusion that the Crown had no power to make the Proclamation in question and that it was illegal and invalid. It was not necessary to deal with the second point that the Proclamation was bad because of its dispensing power. He gave judgment for the defendant with costs.

Leave to appeal was granted on terms.

ACCORDING to information current in Hamburg, orders to the amount of roughly 240 million pesos have already been received by representatives of German firms in South America and Mexico. The following articles are mentioned: Aniline dyes, aniline oil, drugs, photographic articles, sheet metal and tin plates, glass goods, pharmaceutical and chemical products, and the products of the lead and zinc and aluminium industries. If Germany is in a position to fulfil these orders immediately, it is stated that further orders can be reckoned with from South America.

Picric Acid Fumes Action

A CASE of considerable importance to chemical manufacturers, the part hearing of which had already occupied four days at Leeds, was concluded in London on Wednesday, December 11 by Mr. Pollock, High Court Official Referee.

The plaintiff. Mr. Kershaw, of Leamington, and Mary Elizabeth Young, of Harrogate, are the owners of an estate near Halifax called Crow's Nest, in proximity to which are chemical works belonging to Brooks' Chemical Co., Ltd., and during the war the company has been engaged in the manufacture of picric acid. It was alleged on behalf of the plaintiffs in the action that the fumes from the process of manufacture not only constituted a nuisance, but so polluted the atmosphere as to be injurious to animal and vegetable life, thus depreciating the value of the surrounding property. For this they claimed damages and an injunction. In support of their allegation the plaintiffs called a number of witnesses, who spoke of the injurious effect which the fumes had had upon vegetable life, particularly upon trees, and how in consequence of the nuisance it was found impossible to let the property in the vicinity, with the result that it had depreciated in value.

On the other hand, the defendants called witnesses who attributed the non-letting not to the existence of acid fumes, but to the character of the houses, which, said one witness, were in the nature of mansions, for which there was not much demand.

The Referee, in giving judgment, said there were two questions for consideration—first, whether there had been any permanent injury to the property; secondly, if so, what was the amount of damage, which depended upon whether the value had been reduced by the estate being rendered non-residential. The only permanent injury relied upon by the plaintiffs related to the mansion and park. In his opinion there had been no such permanent injury. Every one of the witnesses on behalf of the defendants had said that the injury would pass away. It was contended that the effect of the pollution had been to reduce the estate from residential to pastoral property, but people had no right to assume that the nuisance was to go on for ever. Having seen the premises, he agreed that the condition of the house, the appearance of it, size and arrangements of it all tended to show that it would be exceedingly difficult property to let. The house was very imperfect and inconvenient, and altogether it was a place which was likely to remain empty for a considerable time. The case failed on the ground that there was no permanent injury, but beyond that it seemed that the plaintiffs would not be entitled to recover, because they did obtain the value of the property when they sold it. There must, therefore, be judgment for the defendants, with costs.

Judgment was entered accordingly.

The Committee on Merchandise Marks

THE Merchandise Marks Committee, who are considering the questions of indications of origin on goods and of national trade marks, met at the Board of Trade offices on Thursday and Friday, December 11 and 12, under the Chairmanship of Mr. Harry Greer, M.P. Evidence was given regarding the present position of the matters into which the Committee are inquiring, in so far as those matters affect the Board of Trade and the Customs, by Mr. H. Fountain, an assistant secretary of the Board of Trade in charge of the Commercial Relations and Treaties Department, Mr. Temple Franks, Comptroller-General of Patents, Designs and Trade Marks, and Comptroller of the Industrial Property Department of the Board of Trade, and Mr. J. L. Mackie, an assistant secretary of the Board of Customs and Excise.

AN IMPORTANT DISCOVERY of a new dye, which, it is claimed, may supersede all aniline dyes and establish a great new industry in Britain, has been made by a Harley Street physician. This new product is said to possess florescent properties, and two colours have already been obtained. Those who have seen the results secured are loud in their praise of the beautiful effect which is gained, and say that the discovery is a highly important scientific achievement. It is expected that fuller particulars will be given next month, when it is hoped that one hundred different colours may be evolved. The dye is obtained from organic substances, and one of the ingredients will have to be controlled by the Government.

AT A SITTING of the York Munitions Tribunal, on Friday, December 12, Mr. G. E. Duddington, of 59, Frenchgate, Doncaster, organiser for the Workers' Union, sued the Yorkshire Dyeworks & Chemical Co., Ltd., of Canal Works, Selby, for neglecting to pay, between February 21 and November 19, 1919, the minimum rates of wages settled by agreement under the Wages (Temporary Regulation) Act, 1918. Mr. Duddington made the claim, which amounted to £336 18s., on behalf of 46 men employed by the firm. After hearing the evidence of both parties, the President said that the Selby works were dyeworks only, and not covered by the agreement. The claim therefore failed.

Insufficient Leaving Notice

IN the Bow County Court, on Friday, December 12, before Judge Graham, K.C., Messrs. Jenson & Nicholson, Ltd., of Goswell Works, Wharton Road, Stratford, paint, varnish and chemical manufacturers, sued Mr. Sidney G. Lee, of 25, Suffolk Street, Walton-on-the-Naze, accountant, to recover £25 damages for his having left their employ without sufficient notice.

The plaintiffs engaged the defendant as the head of their accountancy department at a salary of £25 a month, and he started his duties on April 1. On September 7 he wrote giving a month's notice. It was pointed out to him that his position was such that three months would be more a adequate notice, and that he had been promised £100 a year increase at the end of twelve months. He said he was sorry to leave, but his wife had been ordered to the seaside for her health, and he was bound to go; he agreed, however, to stay on till October 31. As a matter of fact, however, he left on October 4.

The plaintiffs brought the action on account of the large amount of labour they employed, as they wished to establish the principle that a man could not go off just when he liked, and throw the work of the business into confusion. In this case 1,500 statements were delayed three weeks, representing a sum of £20,000. They had to call in an accountant to put the matter straight, whilst they were now having to pay his successor £41 13s. 4d. a month

For the defence Mr. Lee said he had always been treated with great kindness and consideration by the firm, and was sorry he had to go, but the doctor said it was imperative for the sake of his wife's health. He accepted a post at Walton-on-the-Naze at less money than the defendants paid him. Defendant went on to say that he acted on legal advice when he left.

Judge Graham said it was quite clear that defendant had no right to have left in a broken month, and had acted very unwisely in doing so. He considered plaintiffs entitled to damages, and awarded £15, and costs on " B " scale.

Leave to appeal was asked for and granted, although Judge Graham told the defendant he considered the case hopeless for him.

Obituary

MR. A. DUCKWORTH.—The death occurred at Ilkley, on Saturday, December 13, after a short illness, of Mr. Albert Duckworth, pharmaceutical chemist, of Brook Street. Mr. Duckworth had been in business in Ilkley for over 25 years.

MR. J. M. WHILE.—Mr. James M. While, M.Inst.C.E., a former general manager of the Darlington Iron & Steel Co., Ltd., and later of the Barrow Hematite Steel Co., Ltd., died on Sunday at Leamington, at the age of 69. He had been in failing health for several years, and was recently advised to reside at Leamington. The funeral took place at Leamington on Wednesday. Mr. While was the second son of the late Mr. Charles While, manager of the Treforest Iron Works. At the age of 24 he was appointed manager of the Gorton Works, Manchester, of Messrs. Bolckow, Vaughan & Co., Ltd., afterwards going to Brown, Bayley & Dixon, Ltd., Sheffield. He spent three years with the Dowlais Iron Co. (now Messrs. Guest, Keen & Nettlefold), and then was general manager to the Darlington Iron & Steel Co., Ltd., from 1881 to 1891, when he resigned to become general manager of the Barrow Hematite Steel Co., Ltd. In 1908 he was appointed a director of the latter company. At the end of 1909 he relinquished the position of general manager, but retained his directorship until 1916. He was the inventor of the present method of rolling tram rails, and was the first to employ mechanical means to remove rails, bars, &c., from the hot saw to the cooling banks in rolling mills.

MR. W. EASTMAN.—The death occurred in London on Tuesday evening following an operation, of Mr. William Eastman, governing director of Eastmans, Ltd., dyers and cleaners.

Recent Wills

Dr. A. G. Vernon-Harcourt, M.A., F.R.S., St. Clare, Ryde, Isle of Wight, past President of the Chemical Society, grandson of the late Archbishop Edward Vernon-Harcourt (Archbishop of York, 1807-1847)	£17,168
Mr. O. Burden, of Leicester, Chemist	£26,020
Mr. G. H. Gibson, of Brigg, Chemist and Druggist	£11,187
Mr. J. C. Verney, F.C.S. of Southwark Street, S.E., Wholesale Druggist	£27,703
Mr. T. F. Ryan of John's Lane Distillery, Dublin, a Director of Power's Distillery	£14,149
Mr. P. Williams, of Brymbo Hall, Brymbo, Denbigh, general manager of the Normanby Park Steelworks, and lately general manager and director of the Brymbo Steel Co., Ltd., Brymbo, Wrexham	£80,057
Mr. A. Tebbutt, druggists' sundriesman, Chiswell Street, E.C.	£11,246
Mr. E. Jones, of Hanley, chemist, aged 63	£6,943

From Week to Week

ONE MAN WAS KILLED as the result of an explosion of nitro-glycerine at Nobel's Factory, Stevenston, on Thursday, December 11.

SIR WILLIAM PEARCE has been appointed a member of the Royal Commission on Awards to Inventors, in place of Mr. H. J. Mackinder, who has resigned.

THE FUNERAL of Colonel Lee Pilkington, whose death was announced in our issue last week, took place on Thursday, December 11, at Nortey.

DAMAGE ESTIMATED AT £2,000 was caused by fire on Tuesday at the works of the Tower Dyeing Co., Radcliffe, the cotton drying stove and contents being destroyed.

THE FRESH CAPITAL of the seven leading companies of the German Colour Combine is stated to be 607,000,000 marks in shares and 81,000,000 marks in debentures.

AS THE RESULT OF LEGISLATION recently passed by the Belgian Chambers, the market sale or keeping in stock of matches containing white phosphorus is prohibited.

THE DEATH HAS TAKEN PLACE at, Leamington, of Mr. J. M. White, who for some years was the general manager of the Barrow Hematite Steel Co., Ltd. He also acted as a director for a few years.

THE PRODUCTION of the window-glass plants in Belgium, which are now in full operation again, is proceeding at the rate of 1,500,000 square metres per month, as compared with a pre-war output of 3,750,000 square metres.

NEWS HAS BEEN RECEIVED at Vancouver that the Boundary Bay Oil Co. has struck oil at a depth of 700 ft. at the shore of Boundary Bay. The engineers made a rough estimate that at present the flow is 25 barrels a day.

IN THE THREE MONTHS ended September 30 aniline dyes amounting to £2,308 were despatched from Yorkshire alone to the United States. There were no exports of dyestuffs in the corresponding period of the previous year.

CAPTAIN R. H. MONTGOMERY, head of the fuel department of the Automobile Association, and secretary of the Joint Fuels Committee, has been appointed to represent the Automobile Association on the Petrol Profiteering Committee.

THE MAGNESITE INDUSTRY of New South Wales, which was in the hands of the Germans and had undergone a setback during the war, is reported to be recovering. Magnesite bricks are essential in the manufacture of steel and in the smelting of copper by the basic process.

THE EXCHANGE COMMITTEE of Libau announces that it intends to set up a sample fair in Libau in June next. It is proposed that its scope shall be international, and shall include samples of raw materials, manufactures, engines, victuals and provisions, &c. The fair is to be held annually.

THE HOME SECRETARY has appointed Mr. William Walker, C.B.E., to be Chief Inspector of Mines, in place of Sir Richard Redmayne, K.C.B., new chairman of the Imperial Mineral Resources Bureau. Mr Walker has been acting as Chief Inspector of Mines for the past three years while Sir Richard Redmayne held the post of chief technical adviser to the Controller of Coal Mines.

ACCORDING TO *Stubbs' Weekly Gazette*, the failures in the United Kingdom for the week ended December 13 were 26, an increase of four. The number of bills of sale registered and re-registered was 134, an increase of 56. Mortgages and charges registered by limited companies amount to £591,251, the amount authorised (where stated) being £1,708,300.

AN INTERNATIONAL COMMERCIAL FAIR, organised entirely by the municipal authorities of Brussels, is to be held in Brussels in April next, and will include the following technical groups: Chemical industry and products, pharmaceutical products and drugs, leather, ceramics, glassware and crystal, metal industries, photography. Applications for space should be made to the Executive Committee of the Fair, Grand Slace 19, Brussels, not later than January 15.

EXTENSIVE DAMAGE was caused by a fire which broke out in the sulphate store-rooms at Lord Ellesmere's by-product works at Brackley Collieries, near Walkden, on Sunday. Lord Ellesmere's fire brigade kept the fire from the large stocks of benzine and other inflammable spirit and from the gas-producing plant, which lights the township of Little Hulton, but the store-rooms and large quantities of sulphate were destroyed.

AT ACTON, last week the first cases under the Profiteering Act were heard, when Vernon Smith & Sons, Ltd., of High Road, Chiswick, were fined £25 in connection with the sale of 2 gallons of petrol for 10s. Evidence was given that the price for 2 gallons was 6s. 8d. elsewhere. The customer was told that the extra price charged by defendants was for carriage to Chiswick. When the case came before the local Profiteering Committee a refund of 3s. 4d. was ordered.

IN A PAPER by Mr. F. A. Matthewson, Sheffield, read at a meeting of the West of Scotland Iron and Steel Institute, held in the Royal Technical College, Glasgow, the problem was dealt with of the prevention of the absorption of sulphur in the melting of steel scrap. Mr. Matthewson stated he had found that by coating of the lumps of scrap with a siliceous wash the absorption of sulphur was prevented in the process of melting, and he explained the method of treating the metal.

A MESSAGE FROM STOCKHOLM, dated December 11, states that the Swedish University Chancellor has recommended the Government to appropriate £1,500 with the object of subscribing £300 annually to the Ramsay Memorial Fund for a five-years' fellowship, entitling Swedish chemists to study chemistry in British institutions. The Chancellor adds that, owing to the great increase and improvement in the British chemical industries during the war, a large number of chemists from various countries would probably visit Great Britain, and that therefore it would be advisable to accept the Ramsay Memorial Fund's offer.

SIR RICHARD GLAZEBROOK, who recently retired from the post of Director of the National Physical Laboratory, has accepted the Zaharoff Chair of Aviation. He has played a prominent part in the development in this country of aeronautics and aeronautical research. In 1909 he was appointed Chairman of the Advisory Committee for Aeronautics formed by Mr. Asquith. Since the war he has served as a member of the Air Inventions Committee, and he has been chairman of the Aeronautical Technical Committee. Concurrently with the University Chair, Sir Richard Glazebrook will hold the post of Director of the Department of Aeronautics at the Imperial College.

DR. CECIL H. DESCH, of the Royal Technical College, Glasgow, has been appointed Professor of Metallurgy at Sheffield University, in succession to Dr. Arnold, who recently resigned and has been elected Emeritus Professor. Dr. Desch, who is 45 years of age, received his scientific training in Finsbury Technical College, the University of Wurxburg and University College, London, and obtained the degrees of D.Sc. (London) and Ph.D. (Wurzburg). In January, 1909, he became Graham Young Lecturer in Metallurgical Chemistry in the University of Glasgow, and in the autumn of 1918 was appointed Professor of Metallurgy in the Royal Technical College, Glasgow.

PROFESSOR ILLINGWORTH, in a Paper before the South Wales Institute of Engineers last week, emphasised the importance of the chemist in colliery and other industrial work. "If we are to progress," said Mr. Illingworth, "every colliery must have its own chemist irrespective of whether or not that colliery is engaged in by-product work. The colliery chemist is an essential to the control of the ventilation of the mine, he is an essential as a check on the working of the coal; the efficient operation of a plant demands chemical control; the chemist must be put in charge of the boiler-house and given full scope for the application of chemical principles to the efficient utilisation of the fuel in the furnaces; boiler water demands the keen chemical control of those factors which lead to the formation of scale, and, in short, the chemist is emphatically worth his place on the staff of any concern engaged in productive operations. In its worst light his salary is comparable to a reliable insurance premium at very favourable rates against breakdown and efficiency."

PROFESSOR A. P. LAURIE, D.Sc., in a lecture to the students of the Royal Academy School on the subject of building materials, dealt with the manufacture, properties and methods of testing Portland cement, and the scientific principles underlying the preparation of the cheapest and strongest concrete. He then went on to show that there were other possibilities for the preparation of useful cements which might be used for cottage building, and referred to the large quantities of gypsum in this country, which in the form of plaster-of-paris made an excellent cement for internal construction. He pointed out that blast furnace slag, if granulated by running into water and then ground with a certain proportion of lime made an excellent cement which had certain defects, but these could doubtless be overcome. He also mentioned the natural cement that we had in blue lias limestone deposits and the improvements that could be made upon it, and on the possibilities of making a sufficiently strong cement by grinding together lightly burnt clay and lime and introducing into that a certain proportion of Portland cement.

Mr. ARTHUR J. MARTIN, M.Inst.C.E., in his inaugural address at the annual general meeting of the Association of Sewage Works Managers in London last week, drew attention to the sanitarian's wasteful methods in his dealings with sewage. In 1898 Sir William Crookes warned them that the question of maintaining the productiveness of our fields might soon become exceedingly grave, and the past five years had shown with startling vividness, the precarious position of our food supply. Year by year we squandered plant food to the value of £20,000,000. Before the war we were spending £15,000,000 per annum on manure from South America. These supplies were fast becoming exhausted, and freights had risen by leaps and bounds. There were ambitious schemes, Mr. Martin said, for the harnessing of atmospheric nitrogen, and, meanwhile, a vast amount of fixed nitrogen was being dissipated into the atmosphere, and poured into rivers and streams. With fertilisers at their present prices, ought they not to see if a method could be derived for turning sewage to useful account? A central testing station at which new processes, precipitants, filtering materials and the distribution of sewage disposal might be judged on their merits was urgently needed. If the Ministry of Health did not take up the matter, the Engineering Standards Committee, which had rendered valuable services in other directions, might undertake the duty, in which case the Government should recognise the national importance of the work by aiding it with a substantial grant.

Chemical Matters in Parliament

Importation of Cement

Mr. J. Davison asked the President of the Board of Trade (House of Commons, December 10) whether there is any prohibition or restriction upon the importation of cement into this country; whether he is aware that, in consequence of the great demand for cement for housing purposes, endeavours have been made to purchase cement from Germany and Denmark, and that replies have been received that it is impossible to send cement here; and whether this position arises out of any action on the part of the British Government.

Sir A. Geddes: The importation of cement is not restricted, and any difficulty in obtaining it from abroad is not due to the action of his Majesty's Government.

Release of Feeding Stuffs

Mr. McCurdy, in reply to Mr. A. Herbert (House of Commons, December 15), who asked how soon the Government would be able to release cake and feeding stuffs for cattle, stated that all descriptions of feeding cakes and meals may be freely purchased. The only form of control now in existence is a system by which the sales of feeding cakes and meals are licensed by an association of the traders acting in co-operation with, and under the supervision of, the Ministry of Food, for the purpose of eliminating speculators and limiting prices. No restrictions are imposed on the freedom of farmers to purchase feeding cakes and meals as, and where they please, for their own use.

Price of Dyes

Major Hurst asked the President of the Board of Trade (House of Commons, December 11) whether he was aware of an allegation that the Piece Price Federation of Dyers, including the Bradford Dyers' Federation, are notifying customers that they will add 50 per cent. to existing charges for dyeing unless they undertake to withhold orders from firms outside the federation; and if he will say what action he proposes to take.

Mr. Bridgeman, Parliamentary Secretary, who replied, said, in a circulated reply: My attention had not previously been drawn to this allegation, but I am causing inquiry to be made.

Sir A. Geddes, in reply to Sir J. D. Rees, who asked whether the recent reduction in the price of coal would be extended to the dyeing and finishing industry, in which the percentage ratio of cost of coal to turnover was exceptionally high, as well as to electricity and gas undertakings, said the answer was in the negative.

Government Dealings in Phosphate

Mr. Hohler asked the Parliamentary Secretary to the Ministry of Munitions (House of Commons, December 17) whether his Department had received any and what difference in price per ton for phosphate rock, pyrites, or sulphate of ammonia, respectively, over the price per ton which his Department paid for it; and, if so, for what work done by his Department had this difference in price been received.

Mr. Hope: I regret to say that there is no profit on these transactions; the second part of the question does not, therefore, arise.

The Chemical Foundation of Industry.

SPEAKING at the recent Exposition of Chemical Industries, Chicago, Mr. C. F. Roth emphasised the importance of chemistry as constituting the foundation of various industries. "Chemistry," he said, "is playing a most important part in industry, and as time goes on will play an ever increasing part; the business that is not founded and administered upon an honest chemical basis, using the most modern and efficient chemical equipment and processes, will be a laggard and failure in the commercial race. American chemical engineering has shown during the past four years its ability to meet all emergencies and the competition of its enemies. There are many manufacturers who do not realise that their organisations and businesses are built upon some chemical truth, that the origin of their business is founded upon some familiar chemical reaction which in its many phases, did they know them, would open whole vistas and ranges of thought, new fields and endeavours to them. All the mechanical industries and the arts use or adopt the products of the chemical industries for their purposes. The chemical industries are the wealth-producing industries, for by them the raw and worthless material is converted into a useful and valuable product, the mechanical industries enhance, through manufacture, that which has already been made valuable, the arts give the intrinsic value to some few of the products of the mechanical industries. Humanity adds the sentimental value. There you have the whole gamut of values as they are brought into being. At the fountain head of all this is chemistry. It is the basis of life and industry. Even agricultural pursuits might be counted as a chemical industry, for we soon see that unless the soil is replenished with the constituents removed by the growing plant it becomes unproductive. "Did all business men sense the value of a chemical study of their processes and place them upon scientific basis, the result would put our domestic industries in an unassailable position, incomparable with the rest of the world."

State Control of German Potash

Workers' Share in Management and Profits

THE new potash law in Germany is designed to socialise the potash industry by giving the workers a larger share in its management and profits, and by unifying its activities under Government control. The new law, which supersedes the Potash Law of 1910, vests the control of the entire potash industry in a State Potash Board. This board is composed of eight members representing employees of potash mines and factories eight representatives of owners of such mines and factories, and 14 representatives of various other phases of the industry, including consumers, dealers and technical experts.

The details of the reorganisation and management of the industry are not prescribed in the text of the law, but are to be worked out by a board of experts and presented to the Government for approval. This board, like the State Potash Board, is composed of representatives of various interests, including consumers of potash; and its personnel is selected by the Government, partly from nominations made by employers' and employees' associations.

The plans for the reorganisation must meet the approval of the National Committee and also of a special Committee of 28 members chosen by the National Assembly; and after such approval the plans are subject to veto by the National Assembly, provided such veto is exercised within 30 days after the plans are laid before the Assembly. The National Government prescribes the manner of fixing prices of potash.

The law provides that the National Government shall issue all executive regulations. The Government may ordain that violations of regulations it issues shall be punished by a fine of 100,000 marks, and in case of repetition of the offence by imprisonment not exceeding one year. The regulations and provisions issued by virtue of section 1 above are subject to the previous approval of the National Committee and also of a committee of 28 members to be installed by the National Assembly. These regulations shall be presented to the National Committee not later than June 30, 1919. The regulations shall be presented to the National Assembly immediately, if it is in session; otherwise immediately after its convocation. They may be rendered inoperative if within one month after presentation to the National Assembly the latter body should so require.

The National Government shall name a board of experts for the potash industry, consisting of 30 members, for the purpose of planning the reorganisation prescribed by Article 1. The National Government shall appoint eight employees' representatives and five employers' representatives as members of this board of experts from nominees designated by the joint organisation formed by the general association of owners and the general association of workmen, which include the various trade unions and employers' associations. Three of the members shall be appointed by the National Committee; the remaining 14 members shall be chosen by the National Government as follows:—

Three shall be selected from the management of the above-mentioned union to be formed for the potash industry, one from among the technical experts of the industry, one from among the commercial employers of the industry, four from the agricultural associations and societies, two from the potash trade, two from chemical industries using potash (one of these two must be a workman), and one from among the experts in potash mining, manufacture and research. The above-mentioned representatives of the technical experts and the representative of the commercial employees are to be appointed by the National Government upon nomination by the respective trade associations which they represent. In nominating the representatives of the potash consumers all different parts of the country shall, as far as possible, be taken into consideration.

Nitrocellulose from Wood Pulp

FOR over 30 years certain sporting powders have been derived in part from wood pulp, but only lately has there been any research looking toward the use of wood pulp in the production of cannon powder. The Forest Products Laboratory in recent experiments has succeeded in producing by all three pulping processes (the soda, sulphate and sulphite) pulps which meet all surveillance tests for use in nitrocellulose manufacture. These pulps have been nitrated at the Picatinny Arsenal and run into powder of several calibres. At certain steps in the process of manufacturing nitrocellulose, wood pulp cannot be handled as easily as cotton, but at other points it yields to treatment more readily. On the whole, the differences in manufacturing are decidedly in favour of wood pulp. The yields are a little less than those obtained from cotton, but the material satisfactorily meets all laboratory tests for cannon powder. Further work to reduce the cost of the wood-pulp product is now under way at the laboratory.—*Technical Notes, U.S. F.P.L.*

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

ASPHALTUM. Determination of the softening point of asphaltum and other plastic substances. D. F. Twiss and E. A. Murphy. *J. Soc. Chem. Ind.*, December 15, 405-406T. A new extension method is described.

BRICKS. Egyptian bricks. G. R. Thompson. *Analyst*, December, 403-405. Analyses of ancient bricks from the hand of Goschen and of Nile mud are given.

GAS. Water gas manufacture in a small gas works. J. W. Gibson. *Gas World*, December 13, 475. The "Simplex" carburetted water gas plant in use at Budleigh-Salterton is described.

Gas purification. D. Vass. *Gas World*, December 13, 478-480. Paper read before the Scottish Junior Gas Association.

Effect of inerts upon the thermal efficiency of coal gas. *Gas World*, December 13, 476-477. Corrigenda for and discussion on Wood's paper. (See CHEMICAL AGE, p. 696.)

Net cost of coal for various systems of gasification. *Gas J.*, December 9 and 16, 541-543, 604-605. Charts are given showing results with vertical and horizontal retorts, with and without steaming.

HYDRIDES. The hydrides of the metallic elements. J. F. Corrigan. *Chem. News*, December 5 and 12, 259-260, 273-275. A description of the preparation and properties of various hydrides.

INDUSTRY. The outlook for British chemical industry. E. F. Armstrong. *J. Soc. Chem. Ind.*, December 15, 447-450R. Chairman's Address to Liverpool Section.

IRON. Future developments in puddled iron manufacture. J. E. Fletcher. *Engineering*, December 12, 804-806. Paper read before the Staffordshire Iron and Steel Institute, November 22.

MUSTARD GAS. Mustard gas manufacture. J. Williams. *J. Soc. Chem. Ind.*, December 15, 451R. Notes on the history of the manufacture since May, 1918.

OILS. The seed crushing industry. J. W. Pearson. *J. Roy. Soc. Arts*, December 12, 50-62. Useful notes on the progress and technical development of the industry.

ORES. Contribution to the study of flotation. *Bull. Inst. Min. Met.*, December, 19 pp. Discussion on Sulman's paper. (See CHEMICAL AGE, p. 623.)

PETROLEUM SPIRIT. Composition of rectified petroleum spirit from toluol-petroleum spirit runnings of Asiatic petroleum. H. G. Evans. *J. Soc. Chem. Ind.*, December 15, 401-402T.

PLANT. Conveyor installation at the Maypole Margarine Works, Southall. G. F. Zimmer. *Engineering*, December 12, 781-783, 790. A fully illustrated account of the plant, with double-page plate.

SULPHURIC ACID. Note on the de-arsenication of sulphuric acid by hydrogen sulphide. T. S. Moore. *J. Soc. Chem. Ind.*, December 15, 399-400T. Useful data on the influence of various factors on the process are given.

Effect of cooling burner gases on the catalytic action of platinum in sulphuric acid contact plants. P. Parrish. *J. Soc. Chem. Ind.*, December 15, 400-401T. Comments on a paper by S. T. T. Geary. (*J. Soc. Chem. Ind.*, 1919, 133T.)

TEMPERATURE. Temperature and Temperature scales. C. W. Kanolt. *Gas World*, December 13, 477-478. Report of a lecture before the Franklin Institute.

TOLUOL. Estimation of paraffins and unsaturated compounds in commercial toluol. H. G. Evans. *J. Soc. Chem. Ind.*, December 15, 402-405T. New methods for carrying out these estimations are described.

ZIRCONIUM. Analysis of Brazilian zirconium ore. A. R. Powell and W. R. Schoeller. *Analyst*, December, 397-400. Methods for the complete analysis of the ore are detailed.

French

ACROLEIN. Stabilisation of acrolein. Search for compounds which will stabilise against the formation of desacryl. C. Moureu, C. Dupaisse and P. Robin. *Comptes Rend.*, December 8, 1068-1072.

ANALYSIS. Process for the determination of metals by electro-deposition without the use of an external source of electric energy. M. Francois. *Ann. Chim.*, September-October, 178-192.

Detection and determination of traces of hydrocyanic acid and thiocyanic acid in complex media. L. Chelle. *Comptes Rend.*, November 24, 973-975.

MIXING. Apparatus for obtaining homogeneous mixtures of liquids very rapidly. P. Jolibois. *Comptes Rend.*, December 8, 1095-1098. A simple apparatus for mixing two liquids is described.

United States

AMMONIA. Heat of reaction of ammonia oxidation. G. B. Taylor *J. Ind. Eng. Chem.*, December, 1121-1123. A formula for calculating the heat of reaction is given, and the best temperature for the process has been worked out.

ANALYSIS. Application of rotating reductors in the determination of iron. W. Scott. *J. Ind. Eng. Chem.*, December, 1135-1138.

ENAMELLING. The cause and control of blistering in sheet steel enamelling. C. Treischel. *J. Amer. Ceram. Soc.*, October, 774-781. Interesting tests bearing on the problems are described.

EXHIBITION. Exposition of Chemical Industries, Chicago. *Chem. & Met. Eng.*, October 8, 449-459. An account of the opening of the exposition on September 22, and of the lectures delivered on that occasion.

EXPLOSIVES. Oxidation in the manufacture of T.N.T. A. S. Eastman. *J. Ind. Eng. Chem.*, December, 1124.

FULLER'S EARTH. Preparation of Fuller's earth. W. C. Phalen. *Chem. & Met. Eng.*, October 8, 469. Useful data on the burning process.

GAS MASKS. Anti-dimming compositions for gas masks. P. W. Carleton. *J. Ind. Eng. Chem.*, December, 1105-1111. H. N. Holmes, F. F. Jewett, G. Leavell, D. Bailey, and E. Shaver, *ibid.*, 1111-1116. An account of the preparation and testing of anti-dimming compositions.

PAINT. Illumination from paint. H. A. Gardner. *Circular 79, Paint Manufrs. Assoc. of U.S.*, 8 pp. Experiments on the reflecting power of various paints are described.

PORCELAIN. Further studies on porcelain. F. H. Riddle. *J. Amer. Ceram. Soc.*, October, 812-827. The effect of changing methods of preparation and composition have been studied.

REFRACTORIES. The work of the Technical Division of the Refractories Manufacturers' Association. R. M. Howe. *J. Ind. Eng. Chem.*, December, 1145-1146. Notes on some tests of the manufacture of fire-bricks.

The selection of refractories for industrial furnaces. W. F. Rochow. *J. Ind. Eng. Chem.*, December, 1146-1149.

Interesting facts concerning refractories in the iron and steel industry. C. E. Nesbitt and M. L. Bell. *J. Ind. Eng. Chem.*, December, 1149-1151.

Superior refractories. R. C. Purdy. *J. Ind Eng. Chem.*, December, 1151-1153.

Refractory problems in the gas industry. W. H. Fulweiler and J. H. Taussig. *J. Ind. Eng. Chem.*, December, 1153-1157.

German

AIR (LIQUID). Apparatus for the storage and transport of liquid air. E. Moser. *Z. angew. Chem.*, November 25, 365-367. Notes on the suitability of materials for containers.

BLAST-FURNACE GASES. Utilisation of blast-furnace gases for fertilising by means of carbon dioxide. F. Riedel. *Stahl u. Eisen*, December 4, 1497-1506. The treatment and application of blast-furnace gas for agricultural purposes is discussed.

FATS. The chemistry and industry of fats in 1914-1918. A. Grün. *Chem.-Zeit.*, November 25, 821-824. The literature on thickened oils, varnishes, splitting of fats, technical fatty acids, and soap, is reviewed. (See also CHEMICAL AGE, pp. 601, 623, 645, 696.)

GASES. Electrical separation of solid and liquid particles from gases. R. Dürrer. *Stahl u. Eisen*, December 4, 1511-1518. Continuation of paper already noted (CHEMICAL AGE, p. 696).

HYDROGEN. Results of the cold-working of hydrogen-containers E. Bock. *Stahl u. Eisen*, November 27, 1467-1470. The explosion of a hydrogen cylinder was traced to the cylinder having been cold-drawn.

METALS. The treatment of complex ores and furnace products. W. Hommel. *Metall. u. Erz.*, November 8, 501-511. Notes on the treatment of complex zinc-lead and other ores.

The Balkans as source of raw material for the German metal industries. H. E. Kepler. *Metall. u. Erz.*, November 8, 512-515. Deposits of arsenic, antimony, bismuth, molybdenum and mercury ores are noted.

SULPHUR. Progress in the inorganic heavy chemical industries during the war. *Chem.-Zeit.*, November 22, 813-816. The literature on sulphur and its compounds is reviewed. (See also CHEMICAL AGE, pp. 645, 696.)

Miscellaneous

ANALYSIS. Estimation of ferricyanide and ferrocyanide. I. M. Kolthoff. *Pharm. Weekblad*, December 6, 1018-1026. Various iodometric methods have been studied.

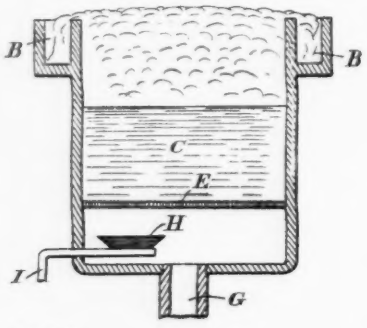
Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

118,627. Ores, Concentration of. W. A. Scott, Marquette Building, Ill., U.S.A. International Convention date (U.S.A.) August 17, 1917.

The process is for the concentration of ores by mixing them into a pulp with water, and agitating and/or aerating the mixture with a small proportion of a frothing agent, usually an oil. The invention consists in using the frothing agent in vaporised form mixed with air, and passing the mixture through the pulp of ore and water.



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When a volatile oil, such as pine oil, is employed as the frothing agent, the amount of vaporised oil introduced into the pulp is about 0·1 per cent. of the ore. The pulp C is supported on a porous diaphragm E, of unglazed porcelain or several layers of canvas. The volatile oil is contained in a vessel H heated by a steam coil I, and air pressure is supplied through the pipe G and is forced upward through the diaphragm E and pulp C. The mineral-bearing bubbles overflow into the channel B. In a modification the air may be introduced into the pulp by mechanical agitation.

129,637. Ammonia, Method of Purifying the Gases Intended for the Synthetic Production of. L'Air Liquide, Société Anonyme pour l'Etude et l'Exploitation des Procedes Georges Claude, 48, Rue St. Lazare, Paris. International Convention date (France), February 15, 1918.

The object is to remove traces of oxygen from mixtures of nitrogen and hydrogen which are used for the direct synthesis of ammonia under very high pressures of 500 to 2,000 atmospheres, as described in Patent No. 130,080 (*see* The Chemical Age of August 30). The gaseous mixture is passed over palladium-asbestos heated to about 300°C., when the oxygen combines with hydrogen to form water vapour, and the gas is then passed into a vessel surrounded by a refrigerating medium, while still at the same pressure. If the cooling temperature is about $-4°$ to $-5°$C., the proportion of water remaining may be reduced to 0·0005 per cent.

134,884. Magnesium Sulphate, Process for the Manufacture of. E. E. Dutt and P. C. Dutt, Jubbulpore, India. Application date, October 18, 1918.

Eighty parts of calcium sulphide are mixed with 90 parts of magnesite containing about 90 per cent. $MgCO_3$ and heated in a reverberatory furnace to dull redness in a stream of air and steam. Calcium carbonate and magnesium sulphate are produced, and the latter is then extracted with water and crystallised. Other magnesium compounds such as the oxide, hydroxide, or chloride may be used, but in such cases carbon dioxide must be supplied in addition in order to form the calcium carbonate.

134,885. Atmospheric Nitrogen, Process for Effecting the Fixation of, in a Blast Furnace. E. W. Haslup, 82, Beaver Street, New York. Application date, October 24, 1918.

Feldspar, lime, magnesia or other material containing an oxide capable of forming a salt with an acid, is mixed with an excess of coke and charged into a blast furnace or gas producer. A hot blast is applied to raise the temperature to 1,400°C., when carbon monoxide is evolved and cyanamides are produced. The gas is tapped off at the hottest zone of the furnace and the cyanamide is thus drawn off with the gas, out of contact with air. The cyanamide is condensed in a scrubber or collector still out of contact with air, so that loss and decomposition are avoided.

134,891. Tungstic Acid from Ores Containing the Same, Recovery of. The Imperial Trust for the Encouragement of Scientific and Industrial Research, Great George Street, Westminster, London, S.W.1, and O. J. Stannard, 65, London Wall, London, E.C.2. Application date, November 6, 1918.

The object is to recover tungstic acid from ores as such wolframite, hubnerite, ferberite, or scheelite. The ore is crushed and mixed with charcoal or other carbonaceous material, and heated to about 300°C. in a current of dry chlorine gas out of contact with air. The tungsten is converted into chlorides and/or oxy-chlorides, and the iron into ferric chloride, all of which are volatilised. The condensed tungsten salts are converted into the oxide WO_3 by treatment with hot or boiling water slightly acidified with nitric or hydrochloric acid. In order to recover the chlorine, the mixture of tungsten chlorides and oxy-chlorides may be heated in a current of dry air to convert them into oxide, so that the chlorine may be used over again. If the ore contains tin, it will be converted into the chloride $SnCl_4$ which distils over with the tungsten chlorides. The distillate is treated with hot water acidified with hydrochloric acid, when tungsten oxide is precipitated, and the stannic chloride remains in solution and may then be recovered.

134,901-2. Hydrogen Generators. A. R. Griggs, Admiralty, London, S.W.1. Application date, November 9, 1918.

134,901. The object is to obtain hydrogen of high purity by a complete evacuation of the residual gases and the gases occluded in the fire brick linings and the iron ore, before commencing a run. Steam jets are arranged in ejector nozzles so as to produce a partial vacuum in the generator to facilitate exhaustion of the residual gas, and a main supply of steam is admitted to the central combustion chamber to clear out that space. The combustion chamber is surrounded by an annular space containing iron ore, which is in turn surrounded by another annular space into which secondary air is normally admitted. Steam may be admitted through the secondary air inlets so as to free these inlets and the outer annular space from the secondary air, without coming into contact with the reduced iron ore to any great extent. The fire brick lining of the generator is made with bricks having bevelled surfaces to facilitate the scavenging action of the steam.

134,902. In hydrogen generators of the kind in which iron ore is alternately reduced and oxidised, a correct adjustment is necessary for regulating the quantity of reducing gas required for reducing the iron ore, and also the proportion of air and reducing gas for primary heating or partial heating and reduction. This is secured by passing the gas supply and the air supply through separate venturi meters. The full and constricted bores of the venturi pipes are connected to two direct reading pressure gauges, so that the volumes or pressures or both, of the reducing gas and air passing to the generator can be directly compared and regulated.

134,920. Potassium Compound, Process for Recovering—in Connection with Cement Manufacture. A. Mond, London. (From the International Precipitation Company Incorporated, 1016, West Ninth Street, Los Angeles, Cal., U.S.A.). Application date, November 13, 1918.

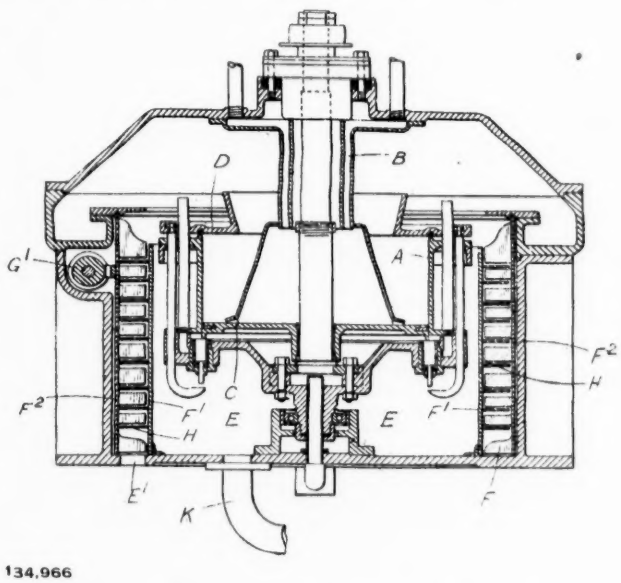
A mixture of limestone and shale in the usual proportions for the manufacture of Portland cement, and having a potassium content of 0·5 to 1·5 per cent., is heated in the ordinary cement kiln with the addition of a small amount of sodium chloride, alkaline earth chloride, magnesium chloride or mixtures of these. The sodium chloride may either be added to the original mixture or to the fuel, which may be powdered coal; preferably it is added to both of these to obtain a maximum yield of potassium. Under the ordinary conditions of cement making, the potassium is converted into the chloride which is volatilised and then condensed in the outlet flues of the kiln, where it may be collected by electrical precipitation or otherwise. The dust thus collected is leached with water at 50° to 100°C., the solution separated from the undissolved residue, and evaporated to crystallise the potassium salt. The mother liquor may be returned to the "wet" grinding plant for the raw materials if such is used, or it may be used for wetting the coal fuel previous to drying and grinding. Alternatively, the mother liquor may be used for extracting the soluble potassium salt. The undissolved residue which contains some potassium is returned to the mixture of raw materials in order to render the process cyclic, and to ensure a complete recovery of the potassium.

134,943. Gases Containing Sulphur Dioxide, Treatment of. E. V. Espenhahn, care of Broken Hill Associated Smelters Proprietary, Ltd., Port Pirie, South Australia. International Convention date (Australia), November 15, 1917.

The process is for the recovery of sulphur from the flue gases from metallurgical furnaces, which may contain about 1 to 2 per cent. of sulphur dioxide. The gas is passed through a series of washing towers containing sodium thiosulphate, which absorbs the sulphur dioxide with the production of polythionates. The liquor from the first tower of the series is withdrawn and heated to 90°-100°C., when sodium sulphate, sulphur dioxide, and free sulphur are formed. The sulphur dioxide is collected and used as required, the agglomerated sulphur is removed, and the sodium sulphate is transferred to a series of cooling towers through which the hot flue gases are passed to cool them and evaporate the sodium sulphate to recover the salt. The precipitated sodium sulphate is mixed with coal or coke and heated in a reducing atmosphere to 900°C.-1,200°C., when sodium sulphide is formed, and then separated by leaching. The sodium sulphide solution is then mixed with another portion of sodium polythionate solution from the washing towers, and sodium thiosulphate and free sulphur are produced. The sulphur is removed, and the thiosulphate is returned to the washing towers for treating a further quantity of gas, thus rendering the process cyclic. The recovered sulphur dioxide may be used for the manufacture of sulphuric acid, or may be passed through a sodium thiosulphate solution to form sodium polythionate. If the sulphur dioxide is maintained under pressure with sodium polythionate solution when the latter is heated, free sulphuric acid is formed as well as sodium sulphate, and the acid may be neutralised with sodium sulphide, thus liberating free sulphur. To obtain precipitated sodium sulphate from the saturated solution in the cooling towers, sodium sulphide solution prepared as above may be added. The sulphate is precipitated and separated, and the diluted sodium sulphide may be used for treating the polythionate solution.

134,966. Centrifugal Separators. R. A. Sturgeon, 18, Festing Grove, Southsea, Portsmouth. Application date, November 22, 1918.

The centrifugal separator is of the kind in which the separated solid matter is dried as it is discharged. The untreated liquid is introduced through the annular conduit B into the rotating vessel A, the base of which is formed by a piston C, which is adapted to rise by the pressure produced by centrifugal force in a liquid introduced below the piston. When sufficient solid matter is accumulated on the inner wall of the rotating vessel, the cover D is lifted and the material is discharged into the top of an annular chamber F formed



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by a fixed inner wall F^1 and an outer wall F^2 which is slowly rotated by a worm G^1. The wall F^1 is provided with annular perforated platforms H and the wall F^2 with scrapers J, so that the material is gradually broken up and forced through the platforms. At the same time, hot air or gas is introduced through the pipe K into the chamber E, and is then transferred by centrifugal force into the annular chamber F. The solid material is thus dried, and is finally discharged through the apertures E^1. In a modification, sets of inclined plates and scrapers may be provided in the chamber F.

135,052. Lead and Tin, Recovery of—from their Solutions. W. G. Rumbold, 69, Childebert Road, Upper Tooting, London, S.W.17. Application date, January 28, 1919.

Lead is soluble in ferric chloride, and tin in ferric chloride or ferric sulphate. To recover the metal, about one-third of the volume of strong ferrous chloride or sulphate solution is added, together with clean scrap iron, and the mixture heated to 60°-80°C. The lead or tin is deposited on the iron.

135,125. Pure Electrolytic Copper from Cement Copper, Process for Manufacturing. A. G. Sundberg and T. E. Thomasson, Helsingborg, Sweden. Application date, May 6, 1919.

Cement copper is roasted or otherwise oxidised, dissolved in acid, and electrolysed, using wholly or partly insoluble anodes. Acid is produced by the electrolysis and is drawn off and caused to act on a further quantity of cement copper, and so on in a continuous cycle.

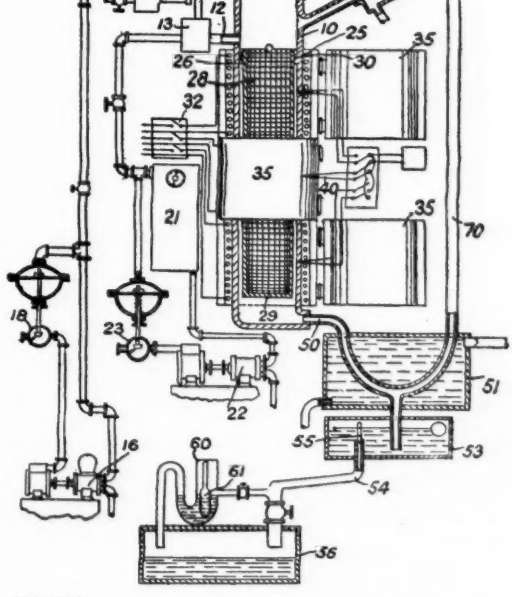
135,141. Alkaline Chloride Solutions which are to be Electrolysed, Process for the Purification of. C. N. Riiber, Trondhjem, Norway. Application date, June 12, 1919.

The alkali chloride solution is treated with alkali carbonate and carbon dioxide, and then boiled, and filtered at a temperature above that at which it is electrolysed. Compounds of the alkaline earth metals are thus eliminated, and choking of the porous disphragm is avoided.

International Specifications not yet Accepted

133,666. Catalytic Hydrogenation. Dayton Metal Products Co., Taylor Street, Dayton, Ohio, U.S.A. (Assignees of T. Midgley, 127, North Ludlow Street, Dayton, Ohio, U.S.A.). International Convention date, October 5, 1918.

The apparatus is of the kind in which vaporised unsaturated hydrocarbon is mixed with hydrogen and passed continuously under pressure over a catalyst at a regulable temperature, and is particularly suitable for producing cyclohexane by the hydrogenation of benzene. The material to be hydrogenised is forced by a pump 16 controlled automatically by a pressure valve 18, through a vaporiser 17 to a mixing chamber 13. Hydrogen is contained in the reservoir 21, which is maintained under pressure by the pump 22, controlled automatically by the pressure valve 23, and the com-



133,666

pressed hydrogen is also supplied to the mixing chamber 13. The mixed gases then pass into the reaction chamber 10, which contains the catalyst 28 in a cartridge 26, which can be withdrawn at the top and replaced when the catalyst becomes spent. The chamber 10 is surrounded by independent electric heating coils 30, controlled by switches 32, and each coil may be enclosed by heat-insulating semi-cylindrical jackets 35. The hydrogenised material passes out by the pipe 50 to the condenser 51, and the condensate is collected

in the vessel 53, from which it passes through a float-operated valve 55 to the tank 56. The unconverted hydrogen returns to the chamber 10 through the pipe 70 and condenser 71. In a modification, the cartridge may be withdrawn at the bottom, and the chamber 10 may be heated by an external steam coil.

133,667. MOTOR SPIRIT. Dayton Metal Products Co., Taylor Street, Dayton, Ohio, U.S.A. (Assignees of T. Midgley, 127, North Ludlow Street, Dayton, Ohio, U.S.A.). International Convention date, October 4, 1918.

Cyclohexane, cyclopentane, cycloheptane, or other naphthene, is mixed with benzene, toluene, or other cyclic aromatic hydrocarbon. The mixture preferred is 80 parts of cyclohexane to 20 parts of benzene.

133,709. MOTOR SPIRIT. U.S. Industrial Alcohol Co., 27, William Street, New York. (Assignees of A. A. Backhaus, 3609, Forest Park Avenue, Baltimore, Md., U.S.A.). International Convention date, November 28, 1917.

The motor spirit consists of a petroleum distillate such as gasoline, ethyl or other alcohol, and carbon bisulphide.

133,712-3. SYNTHETIC RESINS. M. Melamid, 56, Lorettostrasse, Freiburg-im-Breisgau, Germany. International Convention date, February 4, 1918.

133,712. Salts of organic acids of high molecular weight, such as resin acids, humic acids, or lignoceric acid, are treated with aromatic sulphochlorides. The resins are soluble in organic solvents, and may be used for making oil varnishes. In an example given, sodium colophonate is treated with naphthalene sulphochloride.

133,713. In the process described in 133,712 (above) the salts of organic acids are replaced by coal tar, pitch, or such of its fractions as are soluble in alkali; or heavy tar oils obtained in the manufacture of hard pitch may be used.

LATEST NOTIFICATIONS.

136,141. Nitro-cellulose, Acetyl-cellulose, and other Cellulose Esters, Method of Reducing the Viscosity of Viscous Solutions of. O. Carlsson and E. Thall. December 6, 1918.

136,145. Concentrating or Washing Ores and Similar Purposes, Apparatus for. M. Lesser. December 2, 1918.

136,151. Zinc, Recovery of, by Electrolysis. Electrolytic Zinc Co. December 3, 1918.

136,152. Gas Producers, Vaporising Apparatus for. Gaz Pauvre Economique. November 30, 1918.

136,158. Oxides of Nitrogen and a Catalyser therefor, Production of. General Chemical Co. September 7, 1918.

136,163. Sulphite Ores, Process for Treating—by Dissolution and Selection through the medium of a Neutral Solution of certain Chlorides, particularly Ferric Chloride. Soc. Anon. Minerais et Metaux. December 3, 1918.

136,169. Mineral Oils which have been treated with Acid, Process for neutralising. G. Greasid. December 4, 1918.

Specifications Accepted, with Date of Application

117,615. Petrols, Petroleums, Benzols, and the like, Process and Apparatus for the Continuous Fractional Distillation of. E. Barbet et Fils et Cie. July 3, 1917.

120,558. Tar from Tar-containing Liquids, Process for Removing. E. Barbet et Fils et Cie. October 11, 1917.

135,224. Ammonia, Oxidation of. H. E. F. Goold-Adams, J. R. Partington, and E. K. Rideal. July 7, 1917.

135,241. Crucible Furnaces. W. A. Shilton and R. A. Munden. October 7, 1918.

135,246. Potassium Chloride, Manufacture and Production of. E. E. Dutt and P. C. Dutt. October 18, 1918.

135,247. Crucible Furnaces for Melting Aluminium and the like for Casting Purposes. C. F. Price. October 21, 1918.

135,285. Barium Oxide, Process of Producing. J. B. Pierce. November 19, 1918.

135,305. Pyrolusite, Method of Treating. C. V. Jorgensen. November 22, 1918.

135,319. Gas Producers. D. J. Smith. November 28, 1918.

135,322. Grinding, Crushing and Pulverising Mills. J. F. Wake. November 29, 1918.

135,339. Gas Producers. H. M. Iversen. December 11, 1918.

135,348. Damp Peat as taken from the Bog, Preparation of, for the Manufacture of Producer Gas. S. C. Davidson. December 23, 1918.

135,359. Sulphuric Acid, Manufacture of. H. Royal-Dawson. January 4, 1919.

135,382. Grinding Machine. F. Stacey. February 5, 1919.

135,447. Crucible and like Furnaces. J. H. Ritson. July 10, 1919.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations Dec. 10.	Quotations Dec. 17
Alby United Carbide Factories, Ord....	$\frac{13}{16}$–$\frac{15}{16}$	$\frac{11}{16}$–$\frac{13}{16}$
Associated Portland Cement Manufrs. (1900) Lim., Ord.....	24/0–25/0	26/0–27/0
Bell's United Asbestos Co., Lim., Ord.	$1\frac{5}{8}$–$1\frac{7}{8}$	$1\frac{3}{4}$–2
Bleachers' Association, Lim., Ord.....	$1\frac{13}{16}$–$1\frac{7}{8}$	$1\frac{29}{32}$–$1\frac{31}{32}$
Borax Consolidated, Lim., Prefd. Ord.	4–4½	4–4½
Bradford Dyers' Assoc. Lim., Ord.....	$2\frac{5}{8}$–$2\frac{3}{4}$	$2\frac{9}{16}$–$2\frac{11}{16}$
British Aluminium Co., Lim., Ord.....	$1\frac{9}{16}$–$1\frac{11}{16}$	$1\frac{11}{16}$–$1\frac{13}{16}$
British Oil and Cake Mills, Lim., Ord...	$1\frac{21}{32}$–$1\frac{23}{32}$	$1\frac{21}{32}$–$1\frac{23}{32}$
British Portland Cement Manufrs., Lim., Ord.	29/0–31/0	30/0–32/0
Brunner, Mond & Co., Lim., Ord.....	$2\frac{1}{16}$–$2\frac{3}{16}$	$2\frac{3}{16}$–$2\frac{5}{16}$
Castner-Kellner Alkali Co., Lim.....	$2\frac{7}{8}$–$3\frac{1}{8}$	$3\frac{5}{16}$–$3\frac{9}{16}$ ×d
China Clay Corporation, Lim., Ord.....	$\frac{1}{8}$–$\frac{3}{8}$	$\frac{1}{8}$–$\frac{3}{8}$
Cook (Edward) & Co., Lim., 4% 1st Mort. Deb. Stock Red.....	57–61	57–61
Courtaulds, Lim.....	$11\frac{1}{2}$–$12\frac{1}{2}$	11–12
Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefce	$\frac{15}{16}$–1 $\frac{1}{16}$	$\frac{7}{8}$–1
Curtis's & Harvey, Lim.....	69–71	69–71
Electro Bleach.....	21/0	21/0
Explosives Trades, Lim., Ord.....	22/0–23/0	22/0–23/0
Field (J. C. & J.), Lim., Ord.....	$1\frac{1}{16}$–$1\frac{5}{16}$	1–1$\frac{1}{4}$
Greenwich Inlaid Linoleum (Fredk. Walton's New Patents) Co., Lim., Ord.	$\frac{5}{8}$–$\frac{3}{4}$	$\frac{5}{8}$–$\frac{3}{4}$
Harrison & Crosfield, Lim., 10% Cum. Prefd. Ord.....	$1\frac{3}{8}$–$1\frac{1}{2}$	$1\frac{1}{4}$–$1\frac{3}{8}$
India Rubber, Gutta Percha and Tel. Wks. Co., Lim., Ord.....	18½–19	18–19
Lawes' Chemical Manure Co., Lim., Ord.	5–5½	4½–5½
Lever Bros., Lim., 6% Cum. "A" Prefce.....	19/3–20/0	19/3–20/0
Do. 6½% Cum. "B" Prefce.....	19/3–20/6	19/9–20/6
Magadi Soda Co., Lim., Ord.....	20/0–21/0	21/0–22/0
Manganese Bronze & Brass Co., Lim., Ord.	$\frac{11}{16}$–$\frac{13}{16}$	$\frac{11}{16}$–$\frac{13}{16}$
Maypole Dairy Co., Lim., Defd. Ord....	$\frac{27}{32}$–$\frac{29}{32}$	$\frac{7}{8}$–1
Mond Nickel Co., Lim., 7% Cum. Pref.	$1\frac{1}{16}$–$1\frac{3}{16}$	$1\frac{1}{16}$–$1\frac{3}{16}$
Do. 7% Non. Cum. Pref.....	$\frac{7}{8}$–1	$\frac{7}{8}$–1
Pacific Phosphate Co., Lim., Ord.....	$4\frac{3}{4}$–5	$4\frac{3}{4}$–5
Power-Gas Corporation, Lim., Ord.....	$\frac{11}{16}$–$\frac{13}{16}$	$\frac{11}{16}$–$\frac{13}{16}$
Price's Patent Candle Co., Lim.....	91–96	91–96
Salt Union, Lim., Ord.....	$1\frac{11}{32}$–$1\frac{13}{32}$	$1\frac{5}{16}$–$1\frac{11}{16}$
United Alkali Co., Lim., Ord.....	$1\frac{1}{4}$–$1\frac{1}{2}$	$1\frac{1}{4}$–$1\frac{1}{2}$
Val de Travers Asphalte Paving Co., Lim.	$\frac{3}{4}$–1	$\frac{7}{8}$–1
Van den Berghs, Lim., Ord.....	$3\frac{1}{2}$–$3\frac{3}{4}$	$3\frac{1}{2}$–$3\frac{3}{4}$
Walkers, Parker & Co., Lim.....	$1\frac{3}{16}$–$1\frac{5}{16}$	$1\frac{3}{16}$–$1\frac{5}{16}$
Welsbach Light Co., Lim.....	$2\frac{1}{8}$–$2\frac{3}{8}$	$1\frac{3}{8}$–$2\frac{1}{8}$
Gas, Iron, Coal and Steel		
Gas Light and Coke Co., Ordinary Stock (4% Stand.).....	59–62	57–60
South Metropolitan Gas Co., Ordinary (4% Stand.).....	60–63	57–60
Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.....	23/6–24/6	23/6–24/6
Hadfield's, Limited, Ordinary.....	37/6–39/6	37/6–39/6
Staveley Coal & Iron Co., Lim., Ord....	$1\frac{11}{16}$–$1\frac{13}{16}$	$1\frac{11}{16}$–$1\frac{13}{16}$
Vickers, Limited, Ordinary.....	$1\frac{5}{8}$–$1\frac{11}{16}$	31/9–32/9
Armstrong (Sir W. G.) Whitworth, Ltd., Ord.....	31/6–32/6	$1\frac{5}{8}$–$1\frac{11}{16}$
Mines, Nitrate, &c.		
Rio Tinto Co., Lim., Ord. (Bearer).....	41–43	45–47
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5½% 1st. Mt. Debs. Red.....	85–90 ×d	85–90
Lagunas Nitrate Co., Lim.....	1–1½	1–1½
Tarapaca & Tocopilla Nitrate Co., Lim.	14–16	14/0–16/0
Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.....	14½–15½	15–15½
Oil and Rubber		
Anglo-Persian Oil Co., Lim., Cum. 6% Part.....	$1\frac{3}{16}$–$1\frac{5}{16}$	$1\frac{1}{4}$–$1\frac{3}{8}$
"Shell" Transport and Trading Co., Lim., Ord.....	$9\frac{7}{8}$–$9\frac{7}{8}$	$10\frac{3}{16}$–$10\frac{7}{16}$
Do. 5% Cum. Pref.....	$8\frac{1}{2}$–9	$8\frac{1}{2}$–9
Anglo-Java Rubber & Produce Co., Lim	7/3–7/9	7/9–8/3
Anglo-Malay Rubber Co., Lim.....	13/3–13/9	14/1½–14/7½
Chersonese (F.M.S.) Estates, Lim.....	3/10½–4/1½	4/1½–4/4½
Linggi Plantations, Lim., Ord.....	$3\frac{1}{16}$–$3\frac{3}{16}$	$3\frac{5}{16}$–$3\frac{7}{16}$ ×d
Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary	$1^{9}\frac{4}{32}$ $2\frac{15}{16}$	$14\frac{7}{16}$–$14\frac{1}{2}$
Anglo-Maikop Corporation, Ltd., Ord.	$\frac{5}{16}$–$\frac{7}{16}$	$\frac{5}{16}$–$\frac{7}{16}$
Burmah Oil Co., Ltd., Ord.....	$16\frac{7}{8}$–$17\frac{1}{8}$	$17\frac{3}{8}$–$17\frac{5}{8}$

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

THURSDAY, DECEMBER 18, 1919.

The position in the chemical market is without material change. There is continued activity in nearly all the sections of the trade. Prices are generally extremely firm, with an upward tendency, and it is almost impossible to obtain prompt supplies of many products. Perhaps the most noteworthy feature has been the anxiety of buyers to provide for their requirements over the next few months.

The export demand is well sustained, especially on the Far East account.

General Chemicals

ACID ACETIC is very strong and there has been a further advance in price. The few shipments which have come to hand recently have been quickly absorbed.

ACID CARBOLIC is becoming much scarcer and is again higher in price. Makers are heavily committed for forward.

ACID FORMIC is in slightly better supply, without change in value. Imports appear to be declining.

ACID OXALIC is not quite so active as it has been recently, but the price is very firm and arrivals of foreign material have practically ceased.

ACID TARTARIC is in better demand.

AMMONIUM SALTS are extremely active and firm. Many makers are heavily sold ahead.

ARSENIC is in active request and price continues firm.

BLEACHING POWDER is in limited supply and it is difficult to obtain prompt deliveries for export.

BARIUM SALTS are active, and higher prices are asked for chloride.

COPPER SULPHATE is in slightly better request, and there appears to be more inquiry in the market.

EPSOM SALTS are extremely firm. Many makers are heavily sold ahead.

FORMALDEHYDE remains extremely scarce and all recent shipments were sold before arrival.

LEAD SALTS continue active and are higher in price.

MAGNESIUM CHLORIDE is rather scarce and is wanted on export account.

POTASSIUM CHLORATE is easy and only moving off slowly.

POTASSIUM NITRATE is higher in price.

POTASSIUM PERMANGANATE is very active, especially for the B.P. grade.

POTASSIUM PRUSSIATE is very firm with active business passing.

SODIUM ACETATE is active and higher in price.

SODIUM CAUSTIC is steady with slightly better business for export. American makers have again raised their price.

SODIUM NITRITE remains extremely scarce and high prices are being paid for spot delivery.

SODIUM PHOSPHATE is again higher in price with fair business to report.

SODIUM PRUSSIATE is more active and the price has a hardening tendency.

SODIUM SULPHIDE is again higher.

TIN SALTS are very active and higher in price in sympathy with the metal.

ZINC SALTS are only moderately active and price is without change.

Coal Tar Intermediates

It is becoming increasingly difficult to secure even quotations of many leading products. Makers are very heavily committed, while production in some directions has been retarded through one cause and another.

ANILINE OIL is very scarce and makers are behind in their deliveries. There is no change in price.

BETA NAPHTHOL is in active request and some good contracts have been placed for delivery over the first half of next year.

H. ACID is badly wanted and supplies are very scarce.

PARANITRANILINE is also scarce and makers are heavily committed. Price remains very firm.

PARAPHENYLENE DIAMENE is in slightly better request, and price is slightly higher.

SALICYLIC ACID is more active and some good business has been transacted recently at last quoted prices.

Coal Tar Products

The market still continues very firm, and the prospect shows no signs of slackening off. Makers appear to be very fully sold.

90 PER CENT. BENZOL.—There is no alteration to report, prices being nominally 2s. 1½d. to 2s. 2d. f.o.r

CRESYLIC ACID.—The market is still firm, and makers are asking 3s. for 97/99 per cent., and sales have been made of 95/97 per cent. at over 2s. 6d.

CREOSOTE OIL.—The demand for export exceeds the supply, and there is very little available for prompt delivery. Prices are slightly higher.

NAPHTHALENE.—There is very little offering and the price remains as before; £18 to £20 per ton for the refined, and £7 10s. to £9 for crude.

SOLVENT NAPHTHA.—The market appears firm again and the price asked is anything from 2s. 10d. to 3s. per gallon.

HEAVY NAPHTHA.—There is a fair demand at slightly higher prices.

PITCH.—There is a strong demand, and London is quoted at 95s.; East Coast ports at 87s. 6d. to 90s.

Sulphate of Ammonia

The position remains unchanged.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	83	0	0	to	85	0	0
Acetic, 80% pure	ton	67	10	0	to	70	0	0
Carbolic, cryst. 39-40%	lb.	0	0	10	to	0	0	10½
Citric	lb.	0	4	3	to	0	4	4
Formic, 80%	ton	110	0	0	to	112	10	0
Lactic, 50 vol.	ton	70	0	0	to	72	0	0
Lactic, 60 vol.	ton	85	0	0	to	87	10	0
Oxalic	lb.	0	1	5½	to	0	1	6½
Acid, Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	3	2	to	0	3	3
Alum, lump	ton	19	0	0	to	19	10	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18%	ton	18	10	0	to	19	0	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, carbonate	lb.	0	0	7½	to	—		
Ammonia, muriate (galvanisers)	ton	47	0	0	to	49	0	0
Ammonia, nitrate	ton	45	0	0	to	50	0	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Arsenic, white, powdered	ton	65	0	0	to	67	0	0
Barium, carbonate, 92-94%	ton	13	0	0	to	14	0	0
Chloride	ton	22	10	0	to	23	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	17	10	0	to	18	0	0
Borax crystals	ton	39	0	0	to	40	0	0
Calcium acetate, grey	ton	23	0	0	to	25	0	0
Chloride	ton	9	0	0	to	9	10	0
Casein, technical	ton	80	0	0	to	83	0	0
Cobalt oxide, black	lb.	0	7	9	to	0	8	0
Copper, sulphate	ton	42	0	0	to	43	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	175	0	0	to	180	0	0
Iron perchloride	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	84	0	0	to	86	0	0
Carbonate (White Lead)	ton	58	0	0	to	61	0	0
Nitrate	ton	62	0	0	to	63	0	0
Lithophone, 30%	ton	46	0	0	to	48	0	0

	per	£	s.	d.		£	s.	d.
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	11	15	0	to	12	10	0
Sulphate (Druggists')	ton	17	10	0	to	18	10	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	105	0	0	to	107	0	0
Potassium Chlorate	lb.	0	1	0	to	0	1	1
Meta-bisulphate, 50-52%	ton	245	0	0	to	260	0	0
Nitrate, refined	ton	60	0	0	to	62	0	0
Permanganate	lb.	0	3	6	to	0	3	9
Prussiate, red	lb.	0	6	3	to	0	6	6
Prussiate, yellow	lb.	0	2	0	to	0	2	1
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	49	0	0	to	50	0	0
Arsenate, 45%	ton	50	0	0	to	52	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bisulphate, 60-62%	ton	32	10	0	to	33	10	0
Chlorate	lb.	0	0	6	to	0	0	6¼
Caustic, 70%	ton	27	0	0	to	28	0	0
Caustic, 76%	ton	28	0	0	to	28	10	0
Hyposulphite, commercial	ton	19	10	0	to	20	0	0
Nitrite, 96-98%	ton	65	0	0	to	67	10	0
Phosphate, crystal	ton	37	0	0	to	38	0	0
Prussiate	lb.	0	1	1	to	0	1	1½
Sulphide, crystals	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62%	ton	25	10	0	to	26	10	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	40	0	0	to	42	0	0
Tin perchloride, 33%	lb.	0	2	5	to	0	2	6
Protochloride (tin crystals)	lb.	0	1	9	to	0	1	10
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	52	10	0
Sulphate	ton	21	0	0	to	22	10	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	7	to	0	2	9
Aniline oil, drums free	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	6	6	to	0	7	0
Benzidine, base	lb.	0	7	6	to	0	8	0
Benzidine, sulphate	lb.	0	6	6	to	0	7	0
Benzoic, acid	lb.	0	5	3	to	0	5	6
Benzoate of soda	lb.	0	5	3	to	0	5	6
Benzyl chloride, technical	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	2	9	to	0	3	0
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	6
Croceine Acid, 100% basis	lb.	0	4	9	to	0	5	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	7	6
Dinitrobenzol	lb.	0	1	2	to	0	1	3
Dinitrochlorbenzol	lb.	0	1	2	to	0	1	3
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	7	to	0	1	8
Dinitrophenol	lb.	0	1	3	to	0	1	6
Dimethylaniline	lb.	0	3	0	to	0	3	3
Diphenylamine	lb.	0	3	3	to	0	3	6
H-Acid	lb.	0	11	6	to	0	12	6
Metaphenylenediamine	lb.	0	4	9	to	0	5	0
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	3	6	to	0	3	9
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	2	to	0	1	3
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	4	0	to	0	4	6
Paranitrophenol	lb.	0	1	10	to	0	2	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	9	0	to	0	10	6
R. Salt, 100% basis	lb.	0	4	0	to	0	4	2
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	1	7	6	to	1	10	0
Salicylic acid	lb.	0	2	9	to	0	3	9
Salol	lb.	0	4	9	to	0	5	6
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	9	6	to	0	10	6
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Nitrate of Lime

THIS material is again on the market, but now in granular form. Sales are being effected at £19 to £20 per ton, c.i.f. British port.

Nitrate of Soda

Messrs. Henry Bath & Sons report that the production of nitrate of soda during November amounted to 123,380 tons, as compared with 236,943 tons in November, 1918, and for the 12 months to date to 1,723,720 tons, as compared with 2,849,195 tons in the corresponding period. Exports during November amounted to 94,810 tons, leaving a coast stock as at December 1 last of 1,685,000 tons, as compared with 1,657,250 tons on November 1 last.

Glass Blowing for Laboratory Purposes

A MEETING of the Irish Section of the Institute of Chemistry was held on Tuesday, December 9, in the Royal College of Science for Ireland, Professor Adeney presiding. Dr. J. H. Millar, F.I.C., and Mr. J. Andrews, A.I.C., gave a demonstration in glass blowing for laboratory purposes, which included the joining of quill tubing, making of T-pieces, the let-through joint, the filter pump, the spray trap, the distilling flask and potash bulbs. The principles involved and the pitfalls to be avoided were illustrated by Dr. Millar with sketches on the blackboard which enabled the audience clearly to understand the principles underlying the various operations.

Mr. Fletcher, Assistant Secretary, Department of Agriculture and Technical Instruction for Ireland, in proposing a vote of thanks to Dr. Millar and Mr. Andrews, said he considered that, were a local industry established for scientific glass blowing, the outlay would be small, the return prompt, and a very considerable dividend would be likely to be obtained from this expert industry, which would have the further advantage of being able to supply Dublin, and other local centres, on demand with exact specimens to meet the requirements of special needs. He did not see any reason why special courses for college students and post graduates could not be arranged in the College of Science, and further, were such an industry started in Ireland the Department of Agriculture and Technical Instruction for Ireland would be prepared to train the workers in methods of scientific glass blowing.

Mr. T. Mason, seconding, stated that for some time he had been desirous of initiating such an industry, and was anxious to have ex-military men specially trained for this purpose, and was most anxious that this training should be given in Ireland.

Professor Sydney Young, in supporting the vote of thanks, mentioned that when in Austria prosecuting a course in Chemistry, he took some twelve lessons from a professional glass blower. This man supplied the glass for the experimental work, presented him with the pieces of apparatus which he made, gave him detailed instruction, and charged him the princely rate of 1s. 6d. per hour. Had he done nothing else but take these lessons, he would consider his time on the Continent well spent.

Alleged Ammonia Deficiency

AT Ledbury on Friday, December 12, Messrs. J. P. Harvey & Co., of Kidderminster, were summoned for selling shoddy which was said to contain 6 per cent. of ammonia but which did not contain that percentage, and also with selling shoddy not containing 4 per cent. to 5 per cent. of ammonia, as invoiced. It was stated for the prosecution that the shoddy was delivered in August last to a Yardhill farmer; it was said to contain 6 per cent. of ammonia, but there was a deficiency of 50 per cent. The Worcestershire County analyst gave his analysis of the sample supplied and that showed a small deficiency. This, it was urged for the defence, was caused by the shoddy having been sodden by rain during transit in a railway truck from Yorkshire. The Bench decided to convict, and imposed a fine of £5, with £13 costs. Notice of appeal was given, the Bench stating a case. The second case was not proceeded with.

Company News

UNITED INDIGO & CHEMICAL.—Interim dividend of 5 per cent. per annum for six months ending December 31.

MOND NICKEL.—Interim dividend of 1s. per share on Ordinary on account of the year to April 30 next, free of tax, payable February 5.

MAZAPIL COPPER.—Interim dividend of 7½ per cent. (1s. 6d. per share), less tax, payable December 18. Last year, dividend same (paid in October).

ROOIBERG MINERALS DEVELOPMENT CO.—The profit and loss account for the year to June 30 last shows a deficit of £17,548, reducing the balance at credit of appropriation account to £8,073 which is carried forward.

SCARBOROUGH PURE ICE & COLD STORAGE CO.—Dividend of 15 per cent., free of income tax, for the past year, writing £1,545 off goodwill and machinery.

BELL'S UNITED ASBESTOS.—The applications for 110,000 Ordinary shares, having greatly exceeded the number to be issued, the lists were closed on December 10.

LODERS & NUCOLINE.—This company announce that the provisional agreement with the African and Eastern Trade Corporation having been ratified by holders of the requisite minimum number of shares, has become absolute.

CAPE COPPER.—The accounts for the year to August 31 show a loss of £171,006, while, after transferring £35,966 from income tax provision account and £80,000 from the reserve fund, a debit balance of £51,501 was carried forward, as against a credit balance of £4,212 brought down.

HARRISONS & CROSFIELD.—The directors have declared dividends on the cumulative preference shares at the rate of 6 per cent. per annum for three months to Dec. 31 and on the preferred ordinary shares at the rate of 10 per cent. per annum for six months to Dec. 31, both less tax.

POWER-GAS CORPORATION.—The accounts show a profit of £33,561, and £16,797 was brought in, making £50,358. The directors have appropriated £6,700 to reserve, and recommend a dividend at the rate of 6 per cent. per annum, less tax, carrying forward (subject to excess profits duty) £26,309.

MALAYAN TIN DREDGING.—At the meeting of shareholders held on Thursday, Dec. 4, a final dividend of 1s. per share was declared, and at a meeting, also held on same date, the directors declared an interim dividend of 1s. per share, both less tax at 6s. in the £, and both payable on Dec. 30, to holders registered Dec. 4.

INDIA RUBBER, GUTTA PERCHA, AND TELEGRAPH WORKS.—The accounts for the year ended Sept. 30 show a net profit of £71,913, and £90,955 was brought in, making £162,868. Further dividend of 7½ per cent., making 10 per cent., free of tax, for the year, same as for each of the four preceding years; carrying forward £100,368.

STEEL CO. OF CANADA.—The directors have declared the regular dividend of 1¾ per cent. on the Preference shares and a dividend of 1¾ per cent. on the Ordinary shares, with a further ¾ per cent. on the Ordinary, making a total of 7 per cent. on both classes of shares for the year to December 31, payable February 2 to holders of record in Canada January 10.

BRYANT & MAY, LTD.—At an extraordinary general meeting held in London last week, Mr. W. A. Smith presiding, resolutions were carried unanimously to increase the capital of the company from £1,480,000 to £2,000,000 by the creation of 520,000 new shares of £1 each, 320,000 of these shares to be Ordinary shares and the remaining 200,000 partnership shares, and to alter the articles of association.

LEWIS & BURROWS.—A sum of £1,000 out of profits has been added to the depreciation reserve account, and the net balance available is £14,804. It is proposed to place £3,000 to general reserve, to pay a dividend at the rate of 6 per cent. per annum, less tax, on the Preference shares, and a dividend at the rate of 10 per cent. per annum, less tax, on the Ordinary shares, payable December 17, carrying forward £5,006, subject to excess profits duty.

ALGERIAN OILFIELDS.—In a circular to the shareholders of Algerian Oilfields, Limited, the secretary states that the directors have acquired a considerable interest in a freehold property in Trinidad. A private company under the title of the Trinidad Esmeralda Estate, Limited, has been formed, in which a 40 per cent. has been allocated to Algerian Oilfields, Ltd. The working capital asked for has been provided and, work will be started so soon as the necessary machinery is obtained.

KAMUNTING TIN DREDGING.—Net profit for year to June 30, 1919, after setting aside £6,781 for amortisation of capital, £16,776. Dividend of 5 per cent., tax free, proposed; £11,972 paid for excess profits duty for year ended June 30, 1918, and £2,798 forward, subject to staff bonus and to amount recoverable on account of excess profits duty. It is proposed to increase the authorised capital of the company to £300,000, and to enter into an agreement relating to further areas which have been acquired; also to offer to shareholders 130,000 £1 shares at 30s. per share.

NORTH LONSDALE IRON & STEEL.—The report for the year to October 31 last states that after writing off £3,000 depreciation from plant and £3,714 from investments, there remains a credit balance of £38,883, and £15,223 was brought in, making £54,106. The directors recommend that £10,000 be added to the works renewals fund, increasing it to £37,954, and that a further dividend of 9½ per cent., be declared, making 14 per cent., less tax, on the fully-paid capital, leaving £16,106 to carry forward.

SOUTH AMERICAN COPPER.—Lieut.-Colonel H. Edwards (chairman) presiding at the eleventh annual general meeting of the South American Copper Syndicate, Ltd., in London, on Friday, December 12, said that at a meeting shortly to be called for the purpose of submitting accounts for the past year it was the intention of the directors to bring forward proposals for readjusting the present capital, which was quite inadequate compared with the magnitude of the operations carried on by the company.

ELECTROLYTIC ZINC.—It is reported from Melbourne that in the new year the Electrolytic Zinc Co. will require further capital for the extension of the Risdon works. New shares will be offered to the Amalgamated Zinc, Ltd., the North and South Broken Hill Cos., and the Zinc Corporation, Ltd., in proportion to their holdings. These companies will offer shares to individual shareholders for subscription. The ultimate outlay on the Risdon works is estimated at £1,500,000. So far only £500,000 has been expended.

LOW TEMPERATURE CARBONISATION.—At the annual ordinary general meeting, held in London on Monday, Mr. H. L. Armstrong (the managing director) presiding, stated that by the company's patented process, from every ton of coal they got (*a*) Three gallons of motor spirit; (*b*) 16 gallons or more of oils for burning, lighting and lubricating; (*c*) 7,000 cubic ft. of gas of 600 heat units per cubic foot after removal of light oils; (*d*) 20 lb. of sulphate of ammonia; (*e*) 14 cwt. of smokeless fuel. The working cost of their process was less than that of other established carbonising methods and the capital cost of the plant was also less.

ZAAIPLAATS TIN MINING.—The report for the year to July 31, presented at the meeting held in Pretoria on November 28, states that the working profit amounted to £34,652, and £256 was derived from rents and interest. After paying Government royalty, £3,652, and other sums, there was a balance of £28,336, which, with the amount brought in, has been appropriated as follows: Dividend No. 18 of 30 per cent., £19,125; reserve fund (additional amount), £5,000; expenditure on fixed assets, £5,108. At the end of the year the balance to credit of appropriation account amounted to £16,836, as compared with £17,425 at July 31, 1918.

BROZ OILFIELDS, LTD.—At a meeting last week Mr. H. W. Sillem, the chairman, stated that the company had located the outcrop of three seams of coal, excellent in quality, in its southern concessions and over a mile away from the site of the ancient workings. In addition to the coal deposits the company's manager, Mr. Renwick Cowan, formerly of the Pumpherston Oil Co., reports the existence of extensive shale deposits, far surpassing in quality and quantity those of the Scottish shale fields, and practically free from sulphur. The company is increasing its capital to £500,000 by the creation of 400,000 new shares of 10s. each in order to acquire 385 acres of land in the Tabaquite field of Trinidad, in which the Central is now successfully operating.

LAGUNAS SYNDICATE.—Sir Robert Harvey (chairman), presiding at the twenty-fourth annual general meeting in London last week, stated that the gross profit amounted to £41,480, as compared with £87,295 of the previous year. This had been earned on a considerably smaller output. Moreover, they had only taken the gains on the nitrate actually delivered and paid for at June 30 last, and there were certain premiums on their output of potassium nitrate collected subsequent to the aforementioned date which had not been credited. The profits arising from these sources had now been received and would figure in the next accounts. With regard to the future, Sir Robert Harvey said the most hopeful factor was the world-wide demand for nitrate, and, once the many difficulties hampering its free distribution were removed, in spite of the various synthetic products they could, he thought, look forward to a consumption equal to, if not greater than, that of pre-war times.

Holt Thompson & Co., Ltd

Acquisition of a Bradford Fine Chemical Business

MESSRS. HOLT, THOMPSON & CO., LTD., fine chemical manufacturers, Liverpool, announce that they have acquired the whole of the fine chemical business of the Bradford Wool Extracting Co., Ltd., of Pit Lane Mills, Bradford, and are transferring the latter firm's entire plant to their own works at Binns Road, Liverpool.

The Bradford Wool Extracting Co., Ltd., also issue a circular in which they state: "We have transferred our fine chemical business, including all our stocks, plant, processes, records, &c., to our friends, Messrs. Holt, Thompson & Co., Ltd., of Liverpool, who will henceforward carry on at their works the various manufactures which have been associated with our name in the past. We have taken this step in the certain knowledge that Messrs. Holt, Thompson & Co., Ltd., will devote the same care and attention to the manufacture of these products as we have done during the last three years, and under conditions more favourable for their expansion than is possible on our premises, which are already proving inadequate."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Companies Winding Up Voluntarily

THE KIRK CHEMICAL CO., LTD. (in voluntary liquidation).—A general meeting of members will be held at 42, Spring Gardens Manchester, on Wednesday, January 14, 1920, at 12 noon. Robert Miller, Liquidator.

GRAYS CHEMICAL WORKS, LTD. (in voluntary liquidation).—A meeting of creditors will be held at the offices of the Institute of Chartered Accountants, Moorgate Place, London, E.C.2., at 2.30 p.m., on Monday, December 29, 1919. Creditors' claims on or before January 15 to A. N. Harper, A.C.A., Queen's House, 8, Queen Street, E.C.4. A. N. Harper, Liquidator.

TRINIDAD OILFIELDS, LTD. (in voluntary liquidation).—A meeting of creditors will be held at the offices of Messrs. Longcroft, Smith & Co., Chartered Accountants, 2, Broad Street Place, London, E.C.2, on Wednesday, December 31, at 10 a.m. Creditors' claims on or before December 31, to R. G. Longcroft, at the above address. R. G. Longcroft, Liquidator.

Liquidators' Notices

THE BENGAL IRON & STEEL CO., LTD. (in liquidation).—A meeting of creditors will be held at 17, Victoria Street, Westminster, S.W.1, on Friday, December 19, at 11 a.m. E. C. Rutter, Liquidator. This notice is formal. All creditors of the company have been or will be paid in full. Creditors' claims on or before January 22, 1920, to E. C. Rutter, 17, Victoria Street, Westminster, S.W.1.

THE SUN FUEL CO., LTD.—A general meeting of members will be held at 529 to 531, Salisbury House, London Wall, on Wednesday, January 14, 1920, at 12 noon. Lovell & White, Solicitors for the company.

THE WICKWAR CHEMICAL CO., LTD.—A general meeting will be held at 79, Northgate Street, Gloucester, on January 13, 1920, at 3 p.m. H. H. Vowles, Solicitor for the Liquidator.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

ANGLO-COLONIAL DYES, LTD., LONDON, E.C.—Registered December 4, £1,000 second debentures, to J. Lidell & Co., Ltd. 33, King William Street, E.C.; general charge. *Nil. December 31, 1918.

BARNSLEY SMOKELESS FUEL CO., LTD., LONDON, E.C.—Registered December 2, £10,000 second mortgage debentures, balance of £20,000; general charge. *£70,000. January 2, 1919.

WAEN SILICA SAND CO., LTD., MOLD.—Registered December 1, £2,917 debentures, to L. Shaffer, 24, Brazenose Street, Manchester, and another; general charge. *£4,421 12s. 5d. January 10, 1919.

Satisfactions

CROSBY OIL SHALES, LTD., LONDON, E.C.—Satisfaction registered December 5, £3,500, registered July 13, 1918.

LIGHTFOOT REFRIGERATION CO., LTD. (formerly LINDI BRITISH REFRIGERATION CO., LTD.), LONDON, E.C.—Satisfactions registered December 5, £10,000 and any further advances, registered August 31, 1909; all moneys due, &c., registered May 15, 1912; and £30,000, registered August 27, 1915.

NEW ACID CO., LTD., TUNSTALL.—Satisfaction registered December 3, £5,000, registered October 15, 1914.

Bills of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of* 1882 *and under the Act of* 1878. *Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

LEWIS, THOMAS HENRY, 176, Moss Lane East, Moss Side, Manchester, Manufacturing Chemist and Wholesale Druggist. Filed December 13. £30.

RITTER, FREDERICK WILLIAM, 191, Knowle Road, Sparkhill, Birmingham, Chemical Apparatus Manufacturer. Filed December 12, £40.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

STANSFIELD, JOHN L., Boothfold, Waterfoot, Lancs. Chemical manufacturer. £16 0s. 6d. November 5.

HUTCHEONS, J., 139, Edden Hillock Road, Small Heath, Birmingham, Chemist. £16 5s. 2d. November 3.

DAYKIN, T., Market Place, Bolsover, Chemist. £18 12s. 9d. October 30.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

GRAHAM ISLAND (BRITISH COLUMBIA) OILFIELDS, LTD., 5/6, Great Winchester Street, E.C.—To develop petroleum and oil-bearing lands and other mines. Nominal Capital, £100,000 in 400,000 shares of 5s. each. Minimum subscribers, 7 shares. Directors to be appointed by subscribers. Qualification of Directors, £100. Remuneration of Directors, £100 each.

LLOYD, HALL & PROVAN, LTD., 27, Green Lane, Small Heath, Birmingham.—Chemists, druggists and drysalters. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: H. O. Lloyd, "Faronia," Alderbrook Road, Solihull; G. E. Hall, "Lynwood," Campbell Road, Swinton, Manchester; H. D. Provan, "Lindhurst," Warwick Road, Solihill. Qualification of Directors, 750 shares.

CARDIFF ELECTRIC & OX-ACETYLENE WELDING CO., LTD., 51, Londown Square, Cardiff.—Electric welders and oxy-acetylene welders. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: D. W. Thomas, 17, Harrismith Road, Cardiff, Managing Director; Edith Thomas, 17, Harrismith Road, Cardiff. Qualification of Directors: Managing Director, 1,000 shares. Remuneration of Directors, £100; Managing Directors, £500.

HAMPTON CELEBRATION (W.A.), LTD.—To develop diamond, gold, silver, copper, coal, iron, bitumen, petroleum, asphalt and other mines. Nominal Capital, £250,000 in 250,000 shares of £1 each. Minimum subscribers, 50 per cent. Directors to be appointed by subscribers. Qualifications of Directors, 1 share. Subscribers: J. Kellock, 23, Station Road, Leigh-on-Sea; A. M. Hancock, Westbrook, Woodfield Road, Leigh-on-Sea, and five others.

HARDFAST PAINT & CHEMICAL CO., LTD., 4, Moorgate Street, E.C.—Manufacturers of paint, varnishers and other similar products. Nominal Capital, £50,000 in 50,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of Directors, 1,000 shares.

GARNETT PICKLES PREPARATIONS CO., LTD., Cromwell House, High Holborn, W.C. 1.—Chemists, druggists, drysalters, oil and colourmen. Nominal Capital, £3,000 in 1,500 Preference shares and 1,500 Ordinary shares of £1 each. Managing Director: R. G. Pickles, 7, King's Parade, Church End, Finchley, N. 3. Directors: L. A. Moores, 7, King's Parade, Church End, Finchley, N. 3.; T. H. Bailey, 25, Windermere Avenue, Church End, Finchley, N. (chairman); H. A. F. King, 7, Cyprus Avenue, Church End, Finchley, N. Qualification of Directors, £100. Remuneration of Directors, £100 each. Managing Directors and Chairman, £150 each.

A. MAITLAND & CO., LTD.—Chemists and druggists. Nominal Capital, £2,000 in 2,000 shares of £1 each. Directors; J. D. Kienal, 8, Torrington Place, W.C. 1. Qualification of Directors, 1 share.

ANGLO-EASTERN OIL & MINING SYNDICATE, LTD.—To acquire lands, concessions, &c., and prepare for market auriferous quartz, ore, petroleum and other products. Nominal Capital, £3,000 in 2,500 Ordinary shares of £1 each and 10,000 Deferred shares of 1s. each. Minimum subscribers, 7 shares. Directors to be appointed by subscribers. Qualification of Directors, 50 shares. Remuneration of Directors. £50 each; chairman, £75. Directors: J. Bannister, 26, Algernon Road, Lewisham, £75; F. Thornton-Smith, 14, Gomm Road, Rotherhithe, S.E., and 5 others.

COLONIAL OILFIELDS, LTD., 11, Queen Victoria Street, E.C. 4.—To take on lease or licence all kinds of oil-bearing lands, and turn same to account. Nominal Capital, £50,000 in 50,000 Ordinary shares of £1 each. Minimum subscribers, £7. Directors: H. Atkinson, 54, Hillcrest Road, Acton Hill, W. 3.; F. P. Handkins, 69, Boundaries Road, Balham, S.W. 12. Qualification of Directors, 1 share. Remuneration of Directors, £100 each chairman, £150.

METHYLATING CO., LTD., 13, Harrington Street, Liverpool.—Manufacturers of mineralised methylated spirit and finish. Nominal Capital, £750,000 in 150,000 Preference shares of £1, and 600,000 Ordinary shares of £1. Directors: W. H. Ross, Stanmore, Davidson, Mains, Midlothian; R. F. Nicholson, St. John Street, Clerkenwell, E.C.; T. H. Board, Glenhorne, Portshead, Somerset, and 5 others. Qualification of Directors: £100.

GLOUCESTER WELDING & SHEET METAL CO., LTD. 42, Southgate Street, Gloucester.—Oxy-acetylene welders, galvanised iron tank and cistern makers. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors to be appointed. Qualification of Directors, 1 share.

GLASS SUPPLYING CO., LTD.—Glass merchants and manufacturers. Nominal Capital, £10,000 in 10,000 shares of £1 each. Directors: F. V. Lloyd, 19, Coram Street, Russell Square, W.C.; H. C. Fabian, "Fairhaven," Grange Road, Bushey, Herts.

VAUXHALL GLASS MANUFACTURING CO., LTD.—To acquire, and carry on the business of the Vauxhall Glass Works, Ltd. Nominal Capital, £100,000 in 60,000 Participating Preferemce shares and 40,000 Ordinary shares of £1 each. Minimum subscribers, 7 shares. Directors: The Hon. Sir C. Rason, 54, Crystal Palace Park Road, S.E.; J. R. Pakeman, C.B.C., 24, Victoria Road, Kensington; E. Durand, 7, India Street, E.C.; L. C. Bonacchi, 54, Inverness Terrace, W. 2. Qualification of Directors, 100 shares. Remuneration of Directors, £150 each; chairman, £200.

KANSAS OIL SYNDICATE, LTD.—To acquire oil or other mines, mining rights and oil bearing or metalliferous land and turn same to account. Nominal Capital, £10,000 in 9,000 Ordinary shares of £1 and 20,000 Deferred shares of 1s. each. Directors to be appointed by subscribers. Qualification of Directors, 1 share. Remuneration of Directors, £100, other than first Directors: Subscribers: A. Goodwin, 10, Norfolk Street, Strand, W.C.; H. G. Skipp, 15, Cedars Road, Chiswick, W. 4.

KA-NAG-RA CO., LTD., 4, Fernwood Road, Newcastle-on-Tyne.—Chemists and druggists. Nominal Capital, £1,000 in 1,000 shares of £1 each. Directors: J. Bloomfield, 4, Fernwood Road, Newcastle-on-Tyne; J. Wealleans, 26, Glenthorn Road, Jesmond, Newcastle-on-Tyne. Qualification of Directors, 7 shares. Remuneration of Directors to be voted by company.

COLOMBIAN OILFIELDS, LTD., 10, Throgmorton Avenue, E.C. 2.—To prospect for and develop petroleum and oil-bearing lands, gold, lead, tin, copper, coal, iron and other mines. Nominal Capital: £1,000,000 in 1,000,000 shares of £1 each. Minimum subscription, 7 shares. Directors to be appointed by subscribers. Qualification of Directors, £500. Remuneration of Directors, £250, Chairman £350.

INTERMEDIATES AND EXPLOSIVES, LTD., 13, Philpot Lane, E.C. 3.—To make chemicals, coal products and tar products and explosives. Nominal Capital: £50,000 in 50,000 shares of £1 each. Directors to be appointed by Messrs. Bolckow, Vaughan and Co., Ltd.

SHADOW PLAYS FILM SERVICE, LTD., 24, John Street, Bedford Row, W.C.—Film manufacturers. Nominal Capital: £1,000 in 1,000 shares of £1 each. Directors: A. Jowett, "Heathfield," Moorland Drive, Harrogate Road, Leeds; C. S. D. L. Maitland, 20, Percy Circus, Holford Square, W.C. 1; A. H. L. Brades, 20, Percy Circus, Holford Square, W.C. 1. Qualification of Directors, 1 share.

WILLIAM WALKER (WHITEHAVEN), LTD.—Tanners, skinners, curriers and leather dressers. Nominal capital, £300,000 in 300,000 shares of £1 each. Directors: H. W. Walker, Lingniell, Jeascales, Whitehaven, and A. Walker, Oak Lea, Whitehaven (Governing Directors). Qualification of Directors, £500 shares. Remuneration of Directors, £1,000 each Governing Director.

Oil and Tannin from Pimento Leaves

A REPORT from the Imperial Institute on a sample of pimento leaves sent from Jamaica has been published by the Government of the colony. The sample was sent to England to ascertain whether the leaves would be of value as a source of essential oil or for the preparation of a tanning extract. The report states in part:—

"Essential oil.—On steam distillation, the leaves yielded 2·9 per cent. of volatile oil of pale yellowish-brown colour and pleasant odour; the oil is of excellent quality, containing a high percentage of phenols; the phenols isolated from the oil boiled at 253°—255° C. under 750 mm. pressure, and consisted almost entirely of eugenol. The oil would be readily saleable for the manufacture of eugenol, iso-eugonel, and vanilin. The oil was submitted to firms of manufacturers, who considered it of very good quality. One firm valued it at 14s. per lb., the price then quoted for pimento oil. Another firm expressed considerable interest in the oil, and inquired whether it could be prepared and shipped so as to be saleable in the United Kingdom at about 7s. or 8s. per lb. Experiments should, therefore, be made in Jamaica with a view to determining the price at which oil could be remuneratively produced for export."

The report on the tanning value of the leaves follows. One paragraph states:—"In the event of the oil being exported to the United Kingdom, it may prove remunerative to manufacture a tannin extract as a by-product for local use, as, although the material contains only a moderate amount of tannin, it is capable of producing leather of good quality. The preparation of the extract for export would not be advisable unless very large quantities of leaves are to be worked, as expensive and complicated plant (including vacuum evaporators) would be needed. Extract for local use could be prepared by simpler method of evaporation in open pans, or the waste leaves themselves could be used in tanpits in the local tanneries."—*"Times" Trade Supplement.*

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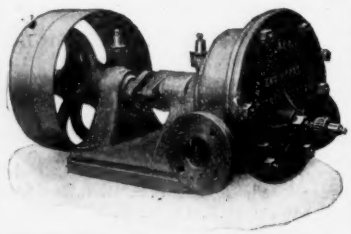

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